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Bits of Experience.

BY JOHN E. SWEET.

(No. III.)

It was my misfortune to miss one of Chordal's early letters in which he called attention to my illustrated card of the different bolt heads, and to which he promised to add one or two of his own. I send the original cuts and have sketched two or three additional specimens; and now if Chordal will add the other forms that have occurred to him we may get the thing pretty complete. I am not aware that there is any accepted standard as to the names of the different bolt heads and screws; in fact, I am aware that there are various names in use for the same thing, but as uniformity in name, though it be a hard one, is better than variety, perhaps this list will be generally accepted. I adopted some of the English names in preference to the American, as they were shorter and quite significant. There are others which seem to be so little in use in this country as to be not worth including.

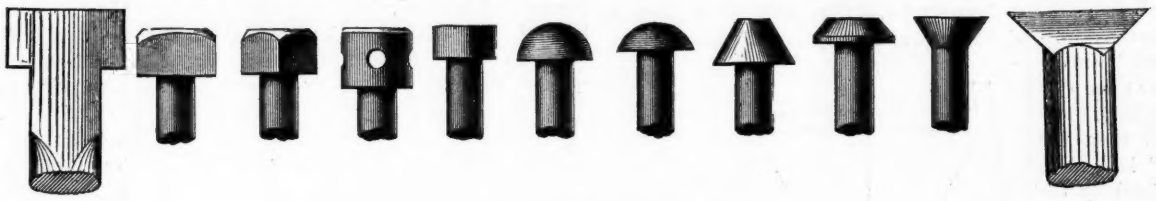
The arrangement shown as "safety-nut" is a good thing in the right place, and only in the right place, that is, when the bolt is subject to a shearing strain, and when they are liable to shake loose. After the larger nut is put on, and a smaller one with finer pitch is set outside, there is no likelihood of their ever coming off. It is as reliable as a split cotter put through a hole in the end of the bolt, and better, inasmuch as it prevents the nut from slacking back. Bolts subject to concussion, jar, or intermittent strains, are liable to break, and there are several ways of overcoming the difficulty. The usual and expensive means adopted are either to make them larger or use better stock. The Paliser method is to turn off the outside of the body of the bolt to the bottom of the thread, and this is the correct thing to do with the bolts in the tool post of a planing machine. The Parsons method is to groove the body of the bolt, leaving four sides full size. Stroudley's method is to drill down from the head end of the bolt to a point opposite the ending of the thread, a hole equal to about one-half the diameter of the bolt. This making a bolt stronger, by cutting one-quarter of it away, seems to be a difficult thing for people to understand, and yet it is a simple affair. If a nick one-eighth inch broad be turned in a bar of two-inch round iron, reducing its size to one inch, it will not require much of a blow to break it, while if two feet of the same bar be turned to one inch in size it will endure a good deal of punishment before breaking. Men understand this well enough in the case of the iron bar, but forget that the ending thread on a bolt puts the stock in about the same condition. The philosophy of the thing, I suppose, is this: The effect of a blow depends upon the distance the hammer moves while it is being arrested, and as the two foot inch-bar would spring nearly 300 times farther than the one-eighth inch nick in the two-inch bar, it must require a good many more, or one much greater blow, to produce rupture. There is another great advantage in the bolts of a reduced section; and for all ordinary uses the Stroudley plan is the best, and that is this: Nuts used on such bolts will not come loose. All iron will stretch a little without taking permanent set. In the ordinary bolt this stretching is entirely confined to the thread between the nut and the body of the bolt. The Stroudley bolt will stretch its entire length, and its elasticity is equivalent to a spring washer which effectually prevents loosening.

I do not suppose our honored friends of the Franklin Institute will ever know what a mountain of trouble they have made outsiders, by their bungling attempt to establish a uniform system of bolt heads and nuts. When they threw aside the formula and made the threads to fit the lathes, they got down to business, and if they had thrown away the rule, and made the heads and nuts to fit a set of standard wrenches, they would have kept the business going. Wrenches, varying by one-eighth inch to one inch, and by one-fourth in. to three inches, would have filled the bill and saved lots of bother. Now we have Philadelphia machinery with finished nuts of one size, with U. S. Standard nuts, and Pratt & Whitney machinery with nuts of another size, besides rough nuts, professing to be of the same size, but upon which the wrench won't quite go. In ordinary affairs, we look for the weaker party to give way to the stronger, but, in this case, if we wait for the Philadelphia tool builders to find out that the U. S. Government, the Car Builders' Association, and the rest of the country are the larger party of the two, it will probably be a long time before we get nuts of a uniform size. I would in no way urge a change in the present practice farther than to ask the Philadelphia people and Brown & Sharpe to come to the rest of the country, instead of advocating uniformity and then not come up to it—because it does not happen to fit their gauges.

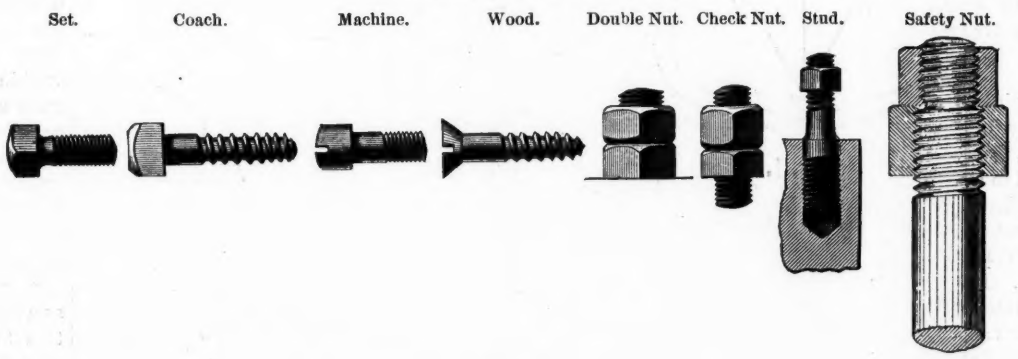
It is quite likely that machine and engine builders know what they are about when they make finished nuts instead of buying them, but if they can make at a less price than they can buy of such makers as the Boston Nut Co., then there is something woefully wrong with the makers' methods, or something wonderfully right in the ways of those who make their own. That those who make their own, with, perhaps, one or two exceptions, fail to produce anything like as good work is very evident. It is a matter of comparative insignificance just what the standard is, providing it be universal. Bad as the standard pitches of gas threads are, they are about the only thing we have that is universal, and any man who would propose to change them ought to be hung. I do not believe that all the advantages that can possibly accrue from the adoption of the metric system, in mechanical constructions, would balance alone the curse that would be sure to follow the misfits in gas fittings for fifty years to come.

If your readers can discover any near relation between the title to these papers and the papers themselves, they can do more than I can; and should they call them "Bits of Experience" with sermon attachments, I will not complain.

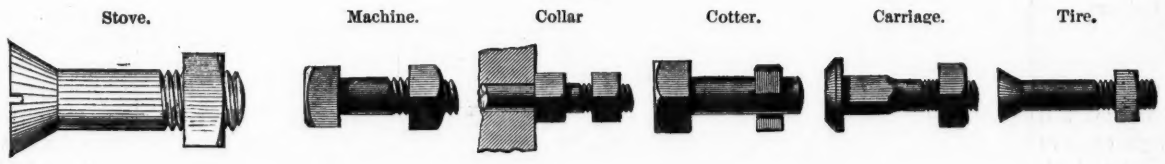
HEADS.



SCREWS, NUTS AND STUDS.



BOLTS.



THREADS.

Turbine Water-Wheels.

BY SAMUEL E. WEBBER, C. E.

While the steam engine and its attachments are justly occupying a prominent place in the discussions of engineers, it seems as though the use of water as a source of power, and the means of making it so available, should not be left unconsidered. The water powers of the United States are among the finest in the world, and, in New England, the immense cotton mills are almost wholly dependent on the streams and rivers for motive power, and the engines that many of the largest mills have put in to help out the constantly-increasing demand for power are still regarded as auxiliaries to the motor engine I propose to consider—namely, the "Turbine Wheel." The turbine is now so far superior to the old-fashioned Breast and Overshot wheels, that these latter may as well be left as relics of a bye-gone age, and not worthy of any further study.

There are, in the different turbines, as in steam engines, a certain amount of sameness in design and construction, but still varying widely in their efficiency. The term "turbine" is from "turbo," a tub; hence the common name of "tub wheel," as applied to a form very often found in the woods, where the economy of first cost, and not in the use of water, was of more importance to the owner of the saw-mill, who generally made his own wheel.

The turbine was first brought to a near approach to the perfect state by two French engineers, M. Fourneyron and M. Jonval, both inventing wheels that, while different in design and construction, still depended on the same principles, so far as utilizing the energy of a descending body of water, and giving a rotary motion to a shaft. In the Fourneyron wheel, or as perfected by an American engineer, Uriah Boyden, of Boston, and known, in this country, as the Boyden wheel, the water is taken to the wheel by a central tube, or pipe, and delivered outwardly, and at the proper angle, by a cone, set with vertical curved vanes, placed, point uppermost, at the bottom of the descending tube. The wheel revolved around this central cone, and was provided with buckets, curved in the opposite way from the vanes on the cone, thus presenting a surface nearly at right angles to the currents of water as they issued from chutes formed as stated. This wheel dis-

charged or vented its water entirely outward. The Jonval received its water directly vertical and discharged downward, the wheel being placed under, instead of around, the guides and chutes. These two forms were brought into general use before the third form, or inward discharge wheel, was invented, which now forms the most numerous class of wheels in use. Here the water surrounded the casing in which the wheel was placed, and entered at right angles to the wheel shaft, through the guides or chutes, and then through the wheel buckets to the central opening, where it was mingled with the water in the tail race.

These three forms—the "outward," the "downward" and "central" discharge—comprise nearly all the wheels made. There are, or have been, one or two forms with an upward discharge, but these wheels are not of enough value to deserve attention.

In addition to the three distinct types mentioned, there are combinations of the downward with the outward discharge, and the downward with the central, this last being a very common form, and better, in every particular, than the purely central or inward discharge. Then we find wheels in which the water is admitted as in a central discharge, but is vented entirely downward, its course being changed, in this direction, by the shape of the wheel buckets. This form is, perhaps, even better than the downward central, as the buckets can be made both longer and stronger for the same size wheel, and this class will, as a whole, show a better "percentage" of power than the others. This term "percentage" is used to express the ratio of duty obtained by the wheel to the theoretical value of the water used, and can only be determined by a "test;" and on this point I shall have more to say.

A packing for the joints of steam pipes and like connections, consisting chiefly of india-rubber, plumbago and iron filings, has recently been introduced. It is applied in a semifluid state, soon vulcanizes or hardens by the heat, and, being metallic, is unaffected by oils. When vulcanized, its surfaces may be joined by using naphtha as a solvent. It can be put between undressed surfaces, thus, in many cases, fitting is rendered unneces sary.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * The boom has struck us and so has the evening darkness. As luck will have it, hurried orders most always come in just when the days get short. You can't always make hay while the sun shines in the machine business. If business moves along at an easy jog, never slack and never overflowing and rushed, the change in the length of days is not of so much importance.

The men can be put on short hours, but this is wrong, for it reduces their pay just when most of them need the most money. The men understand full well that the work done winter mornings and evenings is of small value, even under the best advantage, and putting a shop on short hours in the winter is a fair transaction. If machinists would work at plastering or bricklaying, trades which must save up money enough in summer to keep them over winter, they would learn a trick or two which might be of use in their own trade.

* * * * Instead of cutting down the working hours and the pay, there is another way of outwitting the almanac. That is to cut down the hours and leave the pay as it is, and bring the thing all square by utilizing the long days of summer. I know of many shops working that way. I have worked that way myself in every position about a shop, from cub to super, and found it more satisfactory than any other plan.

There is considerable science required in regulating and arranging the hours on this plan.

I give here a table of hours, calculated by Mr. Chas. A. Bauer, Superintendent of the Champion Bar and Knife Works at Springfield, Ohio.

TIME TABLE. AVERAGE 10 HOURS.

Date.	Go to work a. m.	Be gone to Dinner.	Gohome p. m.
Jan. 1.....	7.15	1 hour	5.
" 8.....	"	"	5.15
" 29.....	7.	"	5.30
Feb. 12.....	7.	"	5.45
" 19.....	6.45	"	6.
Mar. 18.....	"	"	6.15
Sept. 16.....	"	"	6.
Oct. 7.....	"	"	5.45
" 14.....	"	"	5.30
Nov. 11.....	7.	"	5.15
Dec. 2.....	7.	"	5.
" 9.....	7.15	"	5.
" 16.....	"	"	4.50

This table is to be hung up in the shop for the guidance of the men and the genius who attends to the bell or whistle. By carefully going over this table it will be found that it is made to conform to daylight, and that it gives the men ten hours pay, and the shop ten hours work the year around. The pay of the men is never changed. They get ten hours pay every day. It will be seen that the longest shop days, by this table, are from March 18th to September 11th, during which time the days are ten and a half hours long, and that the shortest are from December 16th to January 1st, during which time they are eight hours and thirty-five minutes long.

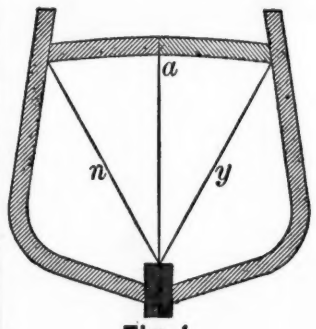


Fig. 1.

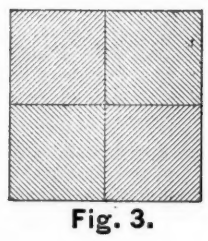
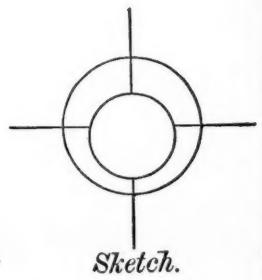


Fig. 3.


Sketch.

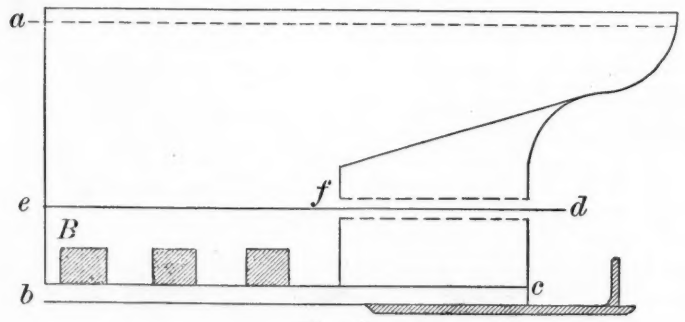


Fig. 2.

This arrangement need not complicate cost accounts, for it need not enter into them.

The more you look into this thing the more you will see what you don't see about the cost matter.

It is giving the men the cream off the milk, for they get full wages in the winter, while the shop makes no money in the winter, and has to run the risk on summer work. But all's well that ends well.

* * * * There are vicious sides to this time-table plan when taken advantage of by unscrupulous men, both owners and workmen. I have heard workmen kicking against the plan, because some rogueish owner had paid them wages during the summer and then put them on starvation piece-work in the winter; and I have seen owners the victims of sharp workmen who drew wages during the winter and went to other shops in the summer. This table is a good gauge for morals. In smooth working shops I have seen men growling in the summer over the long hours. These men were invariably big fools who knew nothing of the laws of compensation or the rules of average.

* * * * But when the boom comes and you can't get men enough to fill up the shop, compensating laws and average time tables won't save you. The shop must not only run ten hours per day, but it must run twenty four hours per day sometimes.

Between you and me, Mr. Editor, the machine business is nice, it's interesting, it's vocative and intellectual, and all that, but the only way to get any money out of it, is to have plenty of work and crowd things. Money can't be made deliberately in any machine shop. When I say plenty of work, I mean all the shop can take care of. A shop a mile long with self winders, and steam setting attachments, and all the modern improvements is tip top so long as the shop is full of work. But it takes lots of work to make it full. When half full, the work costs much more than if the shop was only half as big. The big shops have been envying the little ones for several years, and I know of one large concern who, having looked into the matters deeply and seriously, thought of locking up the place and renting a small concern. The word elephant simply means big, and don't refer to material or direction.

* * * * The work on the north shop is progressing slowly. There is no hurry. There is plenty of work now; in fact there is too much, but the old shop is big enough. Men enough can't be had, and the only outlet is to work long days. We are now running till midnight. I have about concluded that this is too much for men to do. They are glad of the chance, for it makes a big week's wages, but a man can't do more than so much, and I think, a great deal of this extra-time business is money thrown away. It will do for a short spurt but I see several months of it ahead.

* * * * Night work must be done, and some provision for light must be made. In many shops the rule is to pay fifty per cent. additional for night work. This is all right on job work, for the job can be charged with it if the party is over anxious. But when it comes to contract or staple work, fetched deep from bids on an open market, the thing is different.

Here we find that, even with an hour's pay the same, an hour's work isn't the same. If you know of a shop, doing regular machine work, which can get forty minutes work done in an hour after night, I wish you would tell me how they do it. This reduction of the value of an hour adds a big percentage to the cost of work, without the necessity of adding another fifty per cent. to the cost of the labor.

* * * * Men can't do much work after night. If you go into a shop at night, you see a black immensity with little spots of light in it. In the middle of each of these little light spots you will find a little machinist trying to do a little work. Gas light is used, we will assume. The bracket pipes have half-a-dozen elbows, and can be crooked around in every direction, and they have six foot burners with lava tips. You may put more joints in the brackets, you may put on ten foot burners with salamander tips, till you can't rest, but still your light will come from one direction. Even a vise-man must be forever pulling his light around, trying to get it into useful positions. The planer men are happy while a cut lasts, but when it comes to setting work or doing any nice measuring or gauging, trouble begins. Lathesmen ditto, except that this work calls for light projected into deep holes. The men working on the floor are at a fearful disadvantage. They always want something. They can't see it and don't know what direction to go in to look for it. They have burners on the ends of hose, but they don't know where to take the thing next. The same happens when any machinist wants any tool or any piece. Gas can't be carried around nicely, after a man does make up his mind where to search for a thing.

* * * * Bad as it looks, it is better to use the gas for fixed lights and give the men candles. A candle is a real supple affair. You can stick it any where. You may devise and construct ingenious candlesticks, but they will finally yield to a hot pressed nut. If a man leaves a lathe, he leaves the gas burning; he takes his candle with him and when he comes back his gas-light acts as a beacon, and enables him to find his lathe again—if he don't break his neck in the meantime.

* * * * Once on a time, when I was using candles for movable lights, a silver-tongued pedler came along with a gay and festive hand lamp for coal oil. He talked and exhibited. It was small and light in weight, and brilliant and cheap. He couldn't blow it out and I couldn't. He convinced me that it couldn't explode, and gave me testimonials from many shops which *had* been using them. I bought fifty and started the thing up. As was usual with me, I did not deal them out to the boys as supplies, but I presented one to each hand. They were charmed with the taking affairs and proceeded to do the usual elegant engraving of names, etc. The plan was well introduced, but inside a week every lamp had been smashed flat against the only spot of dead wall in the shop. I said nothing, for they were not my lamps. The men might use candles, if they preferred them, but I had my own elegant name on one lamp, and I used the lamp too. One night my own lamp flattened itself against that same wall, and that was the end of coal oil as a portable light for me.

* * * * After being cured of coal oil as a portable light, I gave still further attention to the subject. I saw that all lights were defective for machine work on account of the light coming so decidedly from one direction. This I thought it idle to grumble about, as it couldn't be helped. But I looked deep into the matter of candles. I had been paying eighteen cents a pound for star candles by the box. They gave good light, and were the best I knew of. They dripped all over the tools, and the men, and the work, and the shop, but that was a feature of all candles. One box I got was clear and transparent. They didn't look like the other candles, and, after the box was about half gone, a bill of correction came from the dealers. The candles had been sent by mistake. They were thirty-five cents a pound, and they wanted the difference or the candles. They didn't get either. Something came of this. I noticed that the drip from these candles didn't stick to anything whatever; that is, it would fall off, or could be picked off clean, while, with the star candles, the stuff had to be scraped off. This was a feature on bright work, &c., and I soon found that these candles dripped but very little anyhow, and they didn't gutter any. I then inaugurated a test, and found that a star candle burned two inches nearly while the others burned an inch. This accounted for their cleanliness. The material was only melted as fast as needed by the wick, and it was all used. This put a new face on the thing, and I figured some. As a result of the figuring, I used these candles, thereafter, at thirty-five cents as being cheaper than the star at eighteen. I forget the brand of these candles—I am giving you lots of useful information, you see—but I think they were paraffine. They were elegant looking, and I found the men got into the habit of chewing them like gum, and soon I got into it myself. This ought to be considered in the calculations, for, unless you can confine the chewing to the fag ends, it will count up.

* * * * I thought the candle business as good as it could be, but still I was trying to get lots of work out of a dark shop. I saw that unless the shop, as a shop, was made fairly light, the night work never could be brought anywhere near the day work. I tried to fix things. I gave each man a gas jet, as usual, and a candle, as usual. Then I put in wall brackets everywhere, and put chandeliers with four lights in every important neighborhood. This did the business. Men could see each others' noses, and a man could go and get what he wanted without sneaking all over the shop, like Judas Iscariot looking down a rat hole for eighteen pence. The men were now doing lots of work o' nights, and so was that gas meter. I kept time and watch closely, and found the thing didn't pay. I must let my pipe-fitter cut the gas-meter's part entirely out of the play, or else the play must stop. Gas cost three dollars. I thought of using coal oil for the side lights and chandeliers, and then I thought of the chimneys, and wondered how they would stand the racket. I decided they would not do at all. I could not use coal oil. Then a happy thought struck me. I brought the secretary of the gas company around to the shop, and had everything prepared for him. Every burner was doing its loudest, and I told him to look at that. I showed him last month's big bill, and told him to look at that. He was pleased. Then I told him how much we increased the value of the workmen by the plan, and he was still further pleased. Then I told him if he didn't give us gas at one-fifty, I would stop it to-morrow and put in coal oil. His jaw fell, and then rose in high and mighty argument. I won, and the gas staid in till we joined a couple of neighbors on the same block, and put in a gas machine of our own.

* * * * My experience then, and since, has confirmed me in the opinion that night work can never approach day work in cheapness, unless the atmosphere can be made light, as I did it, or otherwise. Of late years, the electric light *furore* has opened up something new in this line. Some time ago, I looked into the electric question, as applied to shops. I found lots of makers who intended, some day, to offer me the best and cheapest light, &c., but I found that the Brush Company were doing the thing every day, putting the complete thing into shops, and rolling mills, and factories of all kinds. This fixed the matter of good intentions, so I opened up on the company. They sent estimates under guarantee of satisfaction. The outfit complete, giving lights for each shop, the office, &c., would cost only twenty-seven hundred and eighty dollars. This staggered me. We couldn't spare the money, and so I came to the conclusion that the electric light hadn't got completed yet, anyhow. Last winter, Bennett found his shop running every night, and he took up the subject of electric lights. He has a long shop, splendidly suited for it. We conferred together, and went out to Cleveland to see the Brush Company. It was daytime, and, while the newspapers were talking of the hopes of Mr. Edison being able to subdivide the light, we found the handsomest man I ever saw, shut up in a darkened room, with eighteen lights on a single circuit. It was Mr. Brush. After figuring awhile, we went off, engaged to return after dark. The shop is a big concern, and was crowded with orders—running till nine every night. We returned in the evening, and, for the first time in my life, I had the satisfaction of seeing a regular machine shop really lighted up at night and doing effective business. There was no impediment to travel, no wondering if a certain thing was in a certain place. The inside of the shop was light. The keen satisfaction we both had was all that came of the trip. Bennett could not stand the price, and the company had the good sense to stick to the price while they were full of orders.

The Cincinnati Exposition was illuminated by the Brush Company, and this winter promises to keep Bennett busy all night. He has had a relapse and has now bought the apparatus which was used in Cincinnati. It will reach here soon and will be put up instanter. I propose to watch Bennett's shop closely, and you shall hear something from this light, be it for good or for evil.

* * * * I wrote you something of micrometer gauges in my last letter, and I send you herewith a letter referring to this same tool. It was not intended for you or for me, but we have got it all the same.

DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C., July 19, 1879.
Messrs. BROWN & SHARPE,
Providence, R. I.,

Gentlemen:

Please send me by mail one of your micrometer calipers with capacity from one inch to zero. I am an amateur mechanic, and have lived without such an instrument as long as it is bearable. I have a fine lathe, a wife, and three lovely children; a breach-loading fowling piece, telephone, and a homestead in the country, and yet I am not (perfectly) happy by the four-thousandth part of an inch. Inclosed please find $5.00.

Respectfully,
JAMES P. S——.

* * * * If degrees of happiness are measurable, this gentleman ought to get something larger. * * * *

Very respectfully,
CHORDAL.

Putting Shafts in Screw Vessels.

Mr. Editor:—

In the many scientific journals now before the public, I do not remember ever having seen an article on the above subject; I think, therefore, a few plain remarks, in regard to the same will not come amiss, and may possibly be of interest to some of the many readers of your valuable paper.

The first proceeding of importance is to determine the fore and aft center line of the vessel, that being a governing principle in the placing of the shaft. In order to find this line the deck beams must be measured at intervals for the center point and these points connected. In some cases the upper side of the beams or deck is used for the purpose, but the under side is preferable, being equally reliable and more easily measured.

Having ascertained the longitudinal line, which in Fig. 1 is represented by *a*, drop a perpendicular therefrom to the keel, a short distance in advance of the position of the forward bearing of the engine (see B, Fig. 2). If it does not fall exactly in the middle of the keel, adjust by lines N and Y, Fig. 1. Upon this vertical line must be found the point which shall correspond with the center of shaft at the forward bearing. The height, which is taken from the drawings furnished, must be measured from the rabbet of the keel, allowance being made for the depth below. In some cases a more reliable plan might be to bore a hole entirely through the keel, and measure from the bottom. Assume *e*, Fig. 2, as the proper distance, then *e* will be the center of shaft on forward bearing, at which place erect a target; likewise at the stern-post, measure up from the

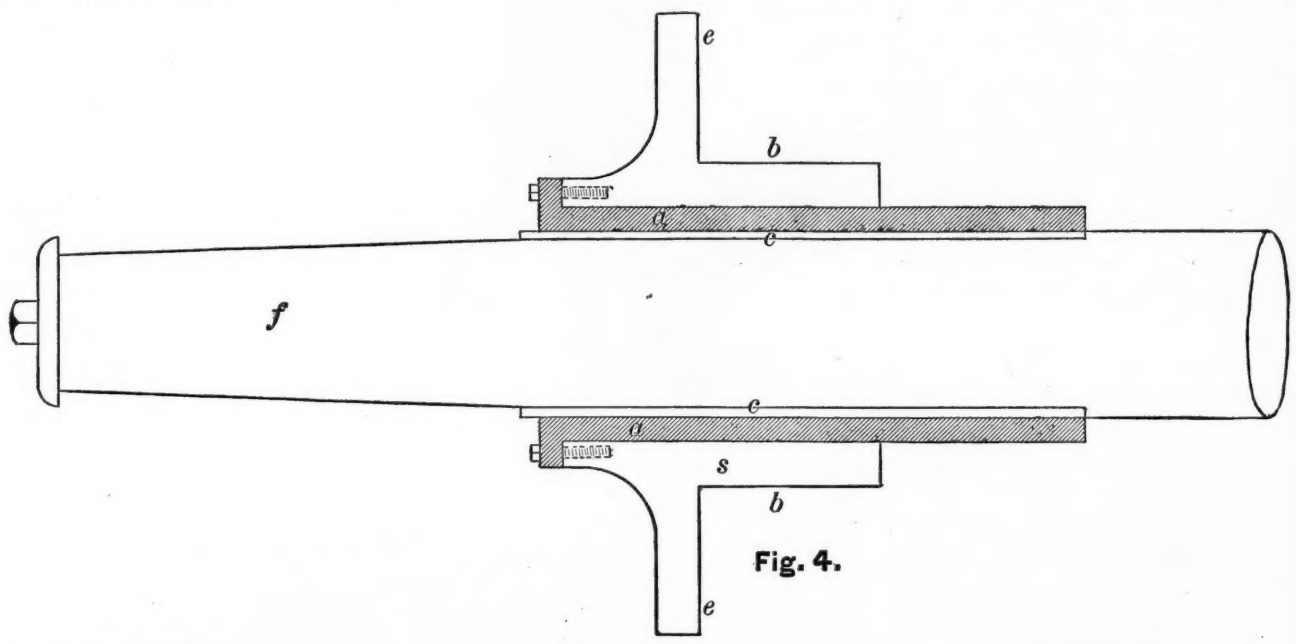


Fig. 4.

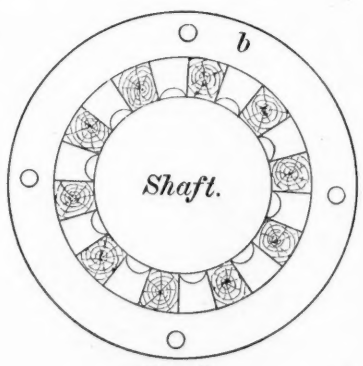


Fig. 5.

bottom of the keel the required height, in order to find a point which shall be the center of the stern bearing, this height being the radius of propeller, plus two inches for clearance above the shoe (see *c*, *d*, Fig. 2). Next find the center of the stern-post, which is done by measuring it at different points and drawing lines through them; a division at the opening will not do, as there may be more of a bulge on one or other of the sides.

We have now the point *e* at the forward bearing, also the point *d* at the stern-post, and it becomes necessary to connect them in some manner, in order to locate the point *f*, or center of opening through the deadwood on the inside of the vessel. This may be done by targets, at points between *e* and *d*, and sighting through them a lighted candle (owing to the darkness of the hold), being held at the opening in the target on the opposite side at *e* as a guide.

Fig. 3 is a section of the deadwood at *f*, on the inside of the vessel, and is composed of four pieces of timber united as in the sketch, showing the opening left by the carpenters.

Targets are metal plates having holes or slits through them.

It is the practice, now, at large shipbuilding works, when constructing a vessel, to make the opening through the deadwood true to line, and sufficiently large, so that no boring is required, but with vessels built at, and received from, *distant points*, to be furnished with screw shafts, it becomes necessary to resort to the boring bar, either to correct or enlarge the opening, in which case, proceed as follows: With *d* as a center, describe a circle large enough for the sleeve and lining surrounding the shaft; on the inside, perform the same operation; if *f* does not fall in the center of the opening, rectify as per accompanying sketch.

The measurements for boring the deadwood are now complete; assume the shaft to be eight or nine inches in diameter; a large boring bar, say six inches, would be used, either with boring head or bar. The bearing for the bar is usually bolted to the stern-post, the boring commenced from the outside at *d*, and when finished coming through the deadwood at *f*, as the center on the inside of the vessel. It is not absolutely necessary to bore from the outside in all cases, for it is a matter of convenience altogether, and is often done from the inside. Whilst the boring is progressing, the foundations for the engine and thrust-bearing should be in process of construction. The bore when completed is ready for the reception of its linings, which, in the first place, consists of a lead pipe about a quarter inch in thickness run through the entire opening and turned over at each end, making a watertight joint on the outside. This pipe was formerly set out with a die on the boring bar, so as to make it conform exactly with the bore; at the present time, however, instead of expanding it with the die, the practice is to use a wooden drift, which answers every purpose.

Secondly.—Where first-class work is required, a copper pipe, having been previously attached to a stuffing box, is put through from the inside, and after the box has been fixed in position, at the point *f*, the other end of the pipe is turned over similar to that of the lead pipe. A composition sleeve, from half to three-quarters of an inch in thickness, and fitted with lignum vitæ bearings, is next forced into a saddle and bolted to it. The saddle is then placed in position, and firmly secured to the stern-post, these forming the stern bearing. The bed plate of engine and the thrust bearing are now bolted to their foundations, the journal boxes put in their respective places, after which a line can be run through the points *e*, *f*, *d*, to ascertain that everything has been accurately placed. The shaft is usually set parallel with the load line, and, where it comes in contact with the lignum vitæ bearings, has a hollow cylinder of brass tightly driven on, secured by screws, the shaft having been turned down to receive it. The end is made taper for the propeller, and, when run into position, which is done from the outside, or point *d*, the propeller is keyed on the taper end, also further secured by a washer, held in place by composition bolt screwed in the end of shaft.

The lignum vitæ bearings in the sleeve are composed of blocks or slabs dovetailed into it, the grain of the wood in the slabs running towards the center of the shaft, in the manner of radii or rays, and having spaces between them for a circulation of water, and to decrease the bearing surfaces. The slabs or blocks are first boiled in linseed oil, to fill the pores of the wood, that they may not swell when in contact with the water, thus preventing an increase of friction. Where the stuffing box and saddle come in contact with the wood, it is necessary to apply a thick coating of red lead, to prevent leakage.

Fig. 4 shows the shaft, with the brass cylinder surrounding it, in position in the sleeve, and the sleeve permanently fixed in the saddle and bolted to it, showing, likewise, the taper end, for propeller, with washer and bolt.

Fig. 5 is an endwise view of the sleeve, showing the arrangement of lignum vitæ slabs or blocks, and water spaces.

It may be proper to remark here that a vessel's lines are not always the same before and after launching, more particularly with very long ones. It is, therefore, advisable, after the shaft and screw are in position, to have the vessel afloat, before finally erecting the engine, as much greater accuracy is thus insured. H. L. STELLWAGEN, M. E.

Boiler Proportion and Construction—Steel Plates—Punching vs. Drilling.

BY WM. H. HOFFMAN, M. E.

In regard to the effect of punching on steel plates, it can be stated with safety that steel plates of suitable grades are far more liable to be injured by punching than wrought iron. Builders of steel boilers, who punch their plates, generally ream the holes to a standard size for rivets, or at least they *should* do so, and if they would anneal the plates after punching, they would further restore the strength, in a great measure destroyed by punching.

But I cannot see the use of punching steel plates, and then adding another expense in two extra operations to get the plates back to anything near their original strength. I believe that all steel plates should come from the rolling mill annealed to their proper working condition, as the mills are fitted with annealing furnaces or ovens constructed on scientific plans, and most of our boiler shops are lacking in this particular at least. Then, in preparation, they should be drilled by a machine similar to one designed by the writer. This machine carries twelve drills, vertically arranged, of course, in a carriage which is automatically fed downwards with an adjustable feed, drilling twelve holes at one operation, the drills being returned after the down stroke by a quick automatic return motion. The drills can be spaced or separated from 1¾ to 2¾ inches from center to center. The tables for holding plates are also moved automatically and by hand when desired.

Five years ago I proved, to the satisfaction of several of our expert boiler makers, the correctness of the principle of drilling both steel and wrought iron plates, by designing and constructing an automatic universal machine for drilling and tapping locomotive fire boxes, *screwing in* the stay-bolts, and then cutting them off. I believe the machine is now at the celebrated Brooks Locomotive Works. It is thoroughly portable, being on small trucks, and is adjustable in every direction, the drill traveling-head having three motions, and is fitted with a universal ball chuck for holding drills, stay-bolts, and cutting-off tool. The machine is furnished with universal clamps for holding it to a great variety of work outside of boiler construction, in fact, it is a boiler and machine shop tool, power being transmitted to it by a small rope.

When the improved machine tools in boiler making once get a firm foot-hold, the wonder will be that they were not adopted years ago, for they certainly have been talked about and dreamed over for more than a dozen years. When they are finally accepted as standard tools, the boiler will then be on the same plane of perfection in the matter of construction as the engine, and its life will be materially lengthened, and the boiler builder will be as proud of the finish and accuracy of his work as our modern engine builder of to-day.

Where wrought iron plates are used and punched, the drilling machine should have come into play, reamers being inserted in the place of drills, and the holes finished to a standard size. Without this precaution the boiler is an imperfect one.

Steam riveting can be applied to wrought iron sheets with safety, but the hydraulic process should always be used on steel plates, and as little hand riveting along with it as possible.

Some one rises to object to our stating that machinery agents never return from the Sweet Bye-and-Bye because their passes run out before they get there. Now we did not mean to hint anything—we are altogether too guileless for that. We merely intended to say that mill machinery men, as a usual thing, chin the denizens of the happy land so successfully, that they never feel disposed to return to these barren shores where pig-headed millers insist on 30 days trial before purchasing, and ten per cent. discount for cash.—*American Miller.*

New Screw Shaving Machine.

The Screw shaving machine represented by the accompanying cut, is made by the Pratt & Whitney Co. of Hartford, Conn., for finishing the heads of machine screws. It is furnished with ten spring collets, a cross rest with two shaving tools, oil tank, dripper and countershaft. The collets are opened and closed in the spindle by a hand-lever without stopping the spindle, and hold screws ¼ to ⅝ diameter, increasing by sixteenths; ⅝ to 1 diameter, by eighths, the heads projecting from the collets to receive the finishing cuts from the shaving tools which are held in the cross rest. The shaving tools are circular, and may be sharpened by grinding without changing their form. Weight, 750 lbs. A machine for lighter work is also made by the P. & W. Co.

Concerning Trade Literature.

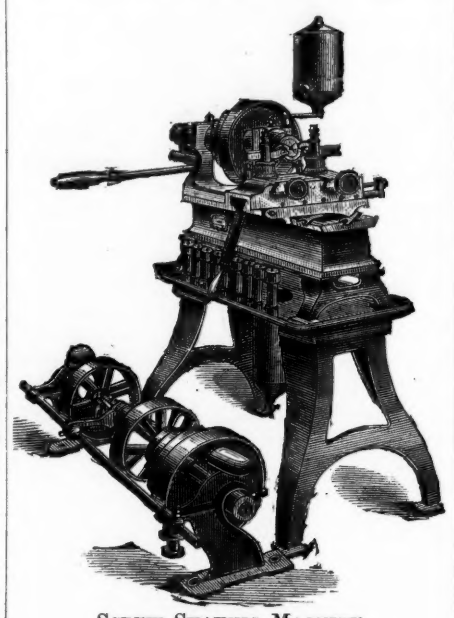
BY PARK BENJAMIN, PH. D.

I am the possessor of a collection of samples of trade literature ranging from the modest circular, first put forth by the tyro inventor, to the plethoric catalogues of the hardware manufacturers. These number, perhaps, a thousand or more, and they were gathered during the editing of an extensive mechanical work, over a period of some three years. They are a suggestive lot to me—in more senses than one—and especially so, rather, for what they might be than for what they are.

I have recently been overhauling and classifying them. I divide them—first, into those which tell something useful to know, or are good to have at hand for reference; second, those which try to give some information, but don't; third, those which tell nothing at all and seemed to be so designed. The first are so few that I may be pardoned for mentioning three shining examples—in the catalogues of Messrs. Prescott, Scott & Co., of San Francisco, Messrs. W. Sellers & Co., of Philadelphia and Messrs. J. A. Fay & Co., of Cincinnati, either of which is a valuable mechanical work. About the others, and, in fact, about the great mass of catalogues and pamphlets in general, I have something to say.

I have taken a catalogue at random from my shelves. It relates to three machines and some tools. There are a few indifferent engravings from which I defy any one to extract the faintest idea as to the construction of the apparatus, beyond such as might be gained by contemplating their shadows on the wall. These illustrations are smearingly printed on bad paper. There is a gorgeous red cover—red and gold—which I suppose is intended to make some amends for the poor interior. I turn to the descriptive matter. For each machine I learn that this "our number 0" (or 00 or 000, just as if there were not enough numerals in the language) patent excelsior * *, made of strong and durable material of improved form and "having our new style of bearings." I am also assured that it supplies a want long felt and (with many emphatic italics and "small caps,") is vastly superior to any similar contrivance known. On the last page is a price list—half blank, which somehow always conveys, to my mind, the notion that the seller is desirous of taking anything he can get. Over the figures—and I presume for my especial benefit—is the red rubber-stamped information, that a discount of 30 per cent. of the prices which *are* stated will be made to me for cash. If I remember rightly, this catalogue was the only reply vouchsafed to a very carefully prepared set of questions, sent to the manufacturer, and designed to elicit the particulars of the construction and working of his products. I infer, that that price list satisfies his customers; though for my part, I never could appreciate the economy which prevents a man printing a new price list whenever he changes his figures. Some one showed me recently a price list printed in 1869, which is still issued by the manufacturers with the statement that they give 80 per cent. discount from its quotations.

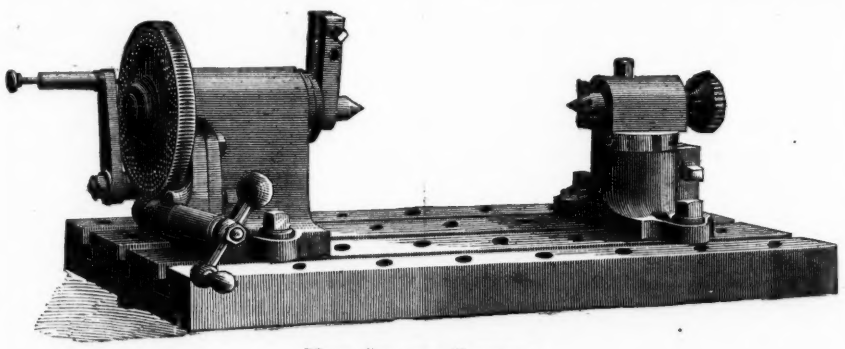
I had nearly forgotten the "testimonials"



SCREW SHAVING MACHINE.

—there are two pages of them in fine type. Jones, foreman of the so-and-so works, says that *he* wouldn't be without the 0. Excelsior; Brown "thinks", it is "the best thing he ever saw;" Smith wants another sent him as it "fills the bill." This is highly instructive, I dare say, to the publishers of the pamphlet, and to the shop-mates of Brown, Smith and Jones, but somehow I fail to gather any novel or satisfying information from the statements.

I take it, that the object of a trade pamphlet is to give information to the public, which shall be beneficial to the manufacturer. It should contain, 1st, a description of the machines produced; 2nd, what they do; 3d, how they do it; 4th, their special advantages; 5th, such proof as can be obtained of assertions made; 6th, prices, discounts and like details. All this can as well be put in condensed form in a simple circular relating to one machine, as in the bulkiest volume describing the varied product of a huge factory. In the vast majority of cases nothing of the sort is done, and, instead, countless publications are issued similar to that which I have attempted to dissect.



NEW SHAPER CENTERS.

The use of pictorial representations of machines is becoming every day more common. With constant practice engravers are advancing in their art, and mechanical engraving has risen to be a trade specialty. Where these illustrations are first made by the scientific periodicals they are generally good; on the other hand, when the manufacturers make them, they are, as a rule, bad or inferior. This rule, like all others, has some exceptions, but I speak of the great bulk of small illustrations in catalogues. There is no economy in a cheap and poor engraving. Fine wood cuts print better and always look well, especially if electrotypes from them be used for printing and the original be retained, as it should be, simply as a mould to electrotype from. There is, beside, a great deal in the way a machine is represented. There is no reason why it may not be treated artistically and picturesquely. No one ever saw a machine floating idly in space, as most of them are depicted; and no one will deny that it makes a much more attractive picture when surrounded by all its accessories and shown in the shop at work. It may be that the cut thus made will cost a little more; but I doubt the economy of the saving as much as I do the mistaken notion which impels a manufacturer to reduce his advertisement to infinitesimally small space, and print it in some thousands of newspapers, not one of which any of his customers is likely to see, instead of properly presenting it in the properly circulated trade periodicals.

The description of what a machine is and how it works should be clear, concise and to the point. Its advantages should be summed up separately in a few orderly and telling sentences. Glowing adjectives and exaggerated assertions carry no weight. Every one knows that the manufacturer is, let us say, somewhat prejudiced in favor of what he makes, and not always in love with his competitor; and when it is very easy to pick out a couple of catalogues from competing firms—such as are now before me—in which each concern fairly exhausts the language in making diametrically opposite statements. Well, the matter is just a little perplexing to the seeker after accurate information.

After the advantages are stated, back them up; not with what Jones thinks or Brown supposes, but with fact. If you have no figures except those determined by yourself, give them with all the data on which they depend, so that they can be verified. Tell Brown that you are deeply grateful for his good opinions, but you would be more so if he would furnish you with a record of the machine's work, and let that speak. Of course, no proof is so good as the results of an impartial test by a reliable engineer, with all the details given; for it is just possible that when Jones sends you his testimonial he thinks to get a fine advertisement for himself when you print it. If the machine worked indifferently, he would never want you to tell the world that his concern uses inferior apparatus. There is no "getting around" the results of an impartial test. A competitor must either make a better showing in the same way or subside.

As for prices, this subject has been so fully discussed that I need add no more than that there seems to be a sensible opinion—that the discount business is overdone, and many people favor positive figures stated and adhered to.

May be my notions as above detailed are Utopian, and the publisher of the red and gold catalogue, I dare say, knows countless reasons why they are utterly chimerical and absurd. Nevertheless, if all the trade publications on my shelves were prepared somewhat as I have indicated, I should feel myself the possessor of a very valuable library of works on American mechanical practice.

New Shaper Centers.

The cut herewith shows a new design for shaping machine centers, made by the Hendey Machine Co., Wolcottville, Conn. They are made especially for their 24-inch shapers, an illustration and description of which was given on page 10, number 5, of the present volume of AMERICAN MACHINIST. The centers can, however, be used on any planer. They consist of a heavy cast-iron table, 24 inches long, which may be fastened in place of the shaper vise (and can be used without centers for planing long work, as the shaper referred to has a stroke of over 24 inches), a head, or center, which carries the index, and can be used by itself, on the regular shaper table, for any work which can be done on an arbor, as the spindle has a taper hole to correspond with the Morse No. 4 drill shank. Work can be put on the arbor, placed in this center, and worked around by the worm in

the index plate; or it can be moved around, by the index pointer, to any graduation on the plate. The back center is made to raise and lower for planing tapers. These centers can also be used on the perpendicular face of the shaper table for planing long, square, or round work on the end, and can be used on a drill press for a great variety of work. The index is from the works of the Brown & Sharpe Manufacturing Co., and can be relied upon for accuracy.

Cutting Screws in the Lathe.

FROM DESIGN AND WORK.

The usual method of accomplishing this work is by means of the apparatus attached to and forming part of what is termed, in trade circles, a screw-cutting lathe, which consists of the ordinary lathe, supplemented with a screw running the entire length of the bed, and capable of being made to gear in or run free of the slide-rest, which is fitted to travel on under-cut plunges the whole length of the lathe bed. The revolutionary motion of the mandrel is imparted to the screw—called the leading screw—running the length of the bed, by means of a series of toothed wheels called change wheels. It will be at once apparent that the ratio of these wheels determines the comparative rate of revolution of the mandrel and the leading screw, and that of course, in effect, controls the rate, pitch, decimal value, or number of threads to the inch of the thread to be cut on the work revolving between the lathe centres.

Before considering the points involved in calculating the ratio of the wheels required to cut a thread of predetermined rate, it will be advisable to consider what the process really is; therefore let us clearly understand the theoretical principles before discussing the details of the practical application of them in workshop practice. Though many methods have their special advocates and claims for consideration, yet the principle of all is nearly the same, and it is only the detail of explanation which makes the one or other course of calculation the better understood and consequently the more readily adapted, and what to one may appear a process quite incomprehensible is to another, who may be in no way better qualified to comprehend, quite a simple and thoroughly understood process. I can only understand this apparent anomaly to result from an obscurity in the explanation.

Before attempting to carry out its practical application, the theoretical principles of screw cutting in the lathe should be thoroughly mastered; and, in fact, this truism holds good in all processes, though more especially those involving mechanical manipulation. Let us suppose a cylindrical rod turned perfectly true and running between the lathe centres and a cutting tool—attached to a nut working on a screw—revolving in fixed bearings parallel to the cylinder or line of centres, placed in a suitable position for turning or cutting the cylinder. Now, it is evident that, on the lathe being revolved and the rotary motion of the cylinder imparted to the screw, the tool attached to it will move in a direction parallel to the axis of rotation of the cylinder, and if the point of the tool be brought sufficiently near to cut the periphery of the cylinder, a spiral groove or thread will be traced thereon. It is also evident that if the cylinder and the guide-screw make isochronous revolutions—*i. e.*, revolve at the same rate—the thread on the cylinder will be of exactly the same rate as that of the screw which guides; and, further, if the guide-screw and the cylinder revolve in the same direction, the threads will be in the same direction; but if these revolutions are in opposite directions, the threads will be reversed—that is to say, one will be right and the other left-handed. Again, when the ratio of the revolutions is made to vary, the ratio of the screw guiding and the screw-nut will vary in the same proportion, and if the cylinder makes two complete revolutions to each one of the leading screws, the spiral traced will be twice as quick as the one that guides.

We will suppose this guide-screw—as above mentioned—to be right-handed, and to have four complete threads to each inch linear measurement, and that motion from the mandrel is imparted to the screw by a series of wheels, which are called change wheels, and for facility of explanation we will suppose to have teeth cut on their peripheries, as of course they do have in practice. When a wheel is fixed to the mandrel, and another of the same size—*i. e.*, number of teeth—fixed to the guide screw, and these two wheels are brought into gearing or revolving, the mandrel will get the result explained above—viz., a thread of four threads per inch will be cut on the cylinder; and as the wheels, and with them the screw and cylinder revolve, in opposite directions, the thread traced will be left-handed. However, to produce a right-handed thread, it is only necessary to separate the two wheels sufficiently to get their teeth out of gear, and connect up the motion by an intermediate wheel, the size of which will have no effect on the ratio of the rates cut, and this will cause both cylinder and screw to turn in the same direction, and, as we have already demonstrated, a right-handed screw will be the result. The relative velocity of the mandrel, which is that of the work on which the screw is to be cut, to that of the guide-screw, may be regulated as required, and right or left-handed screws of any pitch—limited only by the number and variety of the change wheels one is able to use— can be cut by employing wheels proportioned, and the rate of the leading screw being known, this proportion is simply a matter of calculation, involving no very intricate rules. This explanation of the theoretical principles will enable a mere tyro to comprehend the *rationale* of my subsequent theories, and will, I think, materially assist in making clear the process.

Let us now consider the terms we are dealing with, as a variety of synonymous expressions often perplex persons not thoroughly versed in the subject. Screw-threads are described in various ways, and, by way of example, the same thread may be said to be ¼in. pitch, meaning that the distance apart of the threads, measuring in a straight line from one thread to the corresponding part of the next convolution, is one quarter of an inch, or it may be said to have four threads or turns to the inch, meaning that if the same were revolved four times in a nut fitting it, the longitudinal motion would be 1in., or it could be termed .25 pitch, which is precisely the same as the first example, the vulgar fraction being replaced by its decimal equivalent. Similarly, the word *pitch* is often replaced by its equivalent term *rise*.

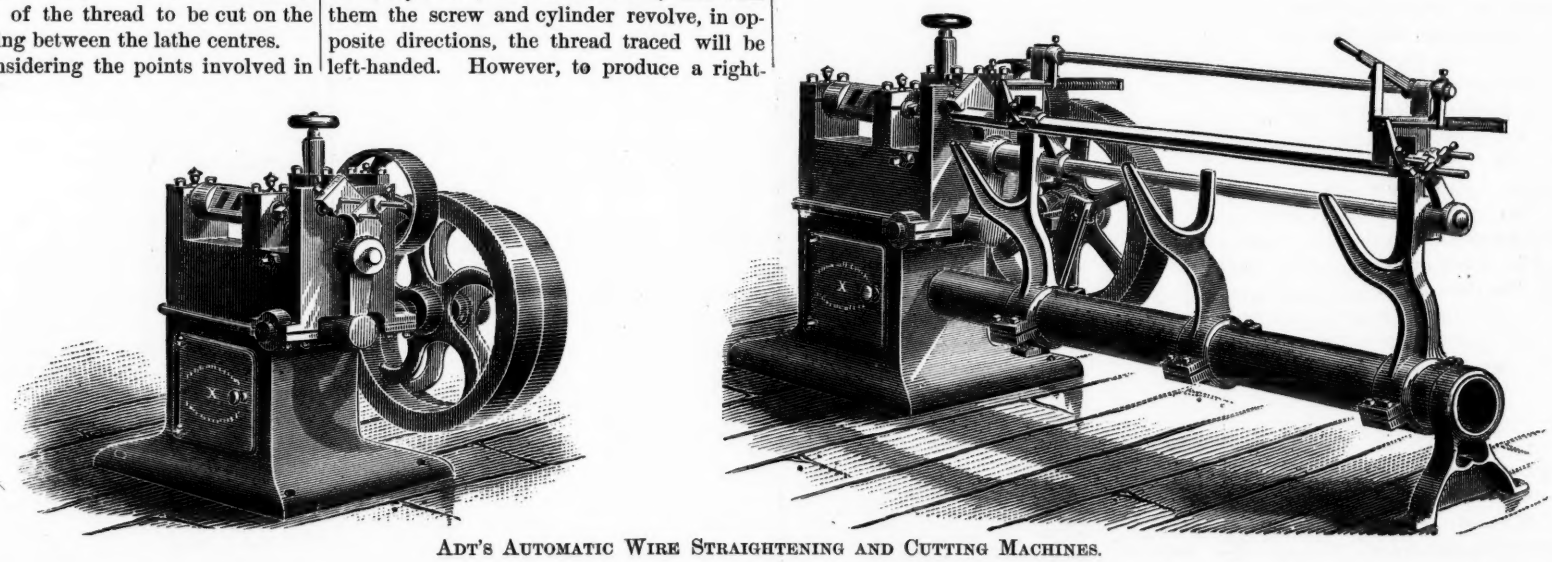
The rule for finding the relative sizes or number of teeth of wheels required to produce a screw of given pitch is most simply expressed in the form of a rule of three sum, thus:—The rate of the guide screw :, the rate of the screw to be cut ::, the diameter of the wheel on the mandrel :, the diameter of the wheel on the leading screw. Thus written the sum bccomes comprehensible to all who have made themselves acquainted with the rudiments of arithmetic. As an example, suppose we want to cut four threads per inch a guide screw of 4-pitch :, then we should write out the proportion thus —:—, 4 (guide screw) :, 4 (thread to be cut) : :, any convenient sized wheel on mandrel :, its duplicate on the guide screw. In this example it is seen at a glance that the rate of thread to be cut and that of the guide screw are the same, and by the theorem above given we know that the wheel will be similarly proportioned—*i. e.*, identical—and also that the introduction of an intermediate wheel will be necessary to make the thread cut right-handed.

Another rule for obtaining the same result is this:—Write down in the form of a vulgar fraction the number of threads on a given length—it may be an inch, a foot, or any length of the guide screw, and the number of threads on an equal length of the screw to be cut; then multiply both, which will not alter the relative proportions of the numbers, by a number which will produce a multiplicand in the form of numerator and denominator of a number equal to some two wheels in the set of change wheels available; then, by putting the quotient of the guide screw on the mandrel, and that of the rate required on the guide screw, the result will be a combination of the required ratio. Example wanted to cut a screw of twelve to the inch, with the same leading screw as before—viz., four pitch. Write down, as I have directed, $\frac{4}{12}$, and multiply by a number to produce figures equal to some two change wheels—say 5; then $\frac{4}{12} \times 5 = \frac{20}{60}$. If you have two wheels of these numbers, put 20 on the mandrel and 60 on the guide-screw, and the desired result is attained. In exactly the same way, by using multiplicands of 8, 10, 12, and 15 respectively, we find that the following wheels will answer equally the purpose:—$\frac{4}{12} \times 8 = \frac{32}{96}$; or $\frac{4}{12} \times 10 = \frac{40}{120}$; or $\frac{4}{12} \times 12 = \frac{48}{144}$; or $\frac{4}{12} \times 15 = \frac{60}{180}$, and so on. The set, or rather pair, of wheels, would be selected according to the suitability of the particular sizes; in any case the result would be the same—either combination would cut twelve threads per inch.

The foregoing examples are of the simplest character, and the method of working them out is superficially apparent. Let us now consider what does not come under this heading, and will require more elaborate calculations. First, there are some threads which positively cannot be cut with accuracy with certain sets of change wheels, and a ready means of distinguishing these is very desirable; they can be told at a glance by an experienced hand. In brief, all *prime* numbers which have not an equivalent wheel, or are not aliquot parts of some wheel in the set, cannot be cut. Prime numbers are those only divisible by unity, and some of the low ones are 3, 5, 7, 11, 13, 17, 19, etc., and when one of these numbers forms a figure in the calculation we at once know that the desired ratio cannot be found, except we have a wheel equal to a multiplicand of such prime number—*e.g.*, with a wheel of 30 we can cut three and five, 35 will do for seven, and 55 for eleven; nineteen can be cut with a wheel of 95, and so on; but when the primes become large, their multiples are beyond the range of an ordinary set of change wheels—say twenty seven, which would require a wheel of 135, and usually sets do not go beyond 120 as the largest. For all practical purposes those prime numbers over twenty have no claim on our attention, as 26 or 28 threads per inch would serve all the purposes of 27, and these two former can easily be cut with the ordinary wheels; it is only to guard against the possibility of tyro readers trying in vain to calculate a series of wheels to produce an impossible (with the means at hand) result.

Automatic Wire Straightening and Cutting Machines.

The accompanying cuts represent a new device for straightening and cutting wire automatically ; the cut on the left represent-



ADT'S AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES.

ing a machine for cutting short lengths, and that on the right—the same style of machine with attachment, for cutting about five feet or less at a time. When straightened wire is run out too long without support the outer end will sag more or less according to the size of the wire, and will also, if fed out by power against a stop or gauge, spring or bend before it can be cut off, either of which will prevent its being cut in accurate lengths. The device here represented will, it is claimed, obviate both these difficulties, and enable wire to be cut to any desired length with absolute accuracy.

The operation of the machine is as follows: The wire enters from the left, through the rotary straightener shown, and as it emerges passes between a pair of adjustable feed rolls, (the pressure on which is regulated by the hand wheel seen at the top,) and is carried through the die seen in the short machine, and against the gauge or stop shown on the cut-off lever. This lever turns on a fulcrum-pin in the middle, and its lower end connects with a cam on the shaft that carries the balance wheel and driving pulley. As the shaft revolves, this cam throws the lever forward and cuts off the wire instantly. The small pulley shown above the shaft of the balance wheel drives the feed rolls. The balance wheel having a turned face may be used as a driving wheel instead of the pulley, whereby a different length may be cut.

The length of cut on this machine can be adjusted from about eight inches down to that of the shortest rivets, varying by the smallest fractions, as desired, the pieces being cut very rapidly.

In the long machine the fulcrum-pin of the cut-off lever is fastened to it, and runs

out in the form of a shaft to about the length that the machine is intended to cut. The bar seen above is connected with the cut-off lever, and has a groove of about the size of the wire to be cut, running its entire length. A movable, adjustable gauge at the outer end is connected by a wire with a clutch on the cam shaft, and as soon as the wire, passing through straightener, feed rolls, and die into the groove, strikes this gauge, it is pushed out a little, pulling the wire and throwing in the clutch, whereby the motion of the revolving balance wheel is communicated to the cam shaft, and the cut-off lever is made to work. At the same time the motion of the long shaft, or fulcrum, by means of the small levers and springs shown above the grooved bar, throws a cover off the groove, and the cut-off wire drops in the forked receptacles, seen below. If the last piece of the coil should not be long enough to strike the gauge, it will remain in the grooved bar, in which case the handle seen above the bar may be depressed, which will throw the above-mentioned cover off and allow the piece to drop out. Wire can be cut on this machine very rapidly; one intended for cutting ⅛ and smaller wire in lengths of sixteen feet having cut six such lengths per minute while running at a moderate speed.

These machines are manufactured by the inventor, Mr. John Adt, at New Haven, Conn., who has made a study of this class of machinery for years, having probably constructed more machines of different kinds for straightening and cutting wire than any other machine builder in the world. He recommends this machine as being superior to anything he has heretofore made, and, as he believes, to anything else now in use for the purpose. The machines, as illustrated, are furnished of different sizes suitable for any size of wire in use, and the prices are said to be very reasonable. Roll straighteners are furnished in place of the rotary on the smaller sizes for those who prefer to use that kind.

Compressed Air.

No. II.

BY JOHN FISH, M. E.

By means of passing the compressed air through hot water, the great difficulty of utilizing air economically, at great initial pressures, by expansion, has been overcome. And, at the present time, there does not seem to be any difficulty at all in using compressed air, economically, on engines, for city tramways and tunnels, for mines, and many places where steam would be particularly objectionable.

One very important advantage, in using compressed air, is the ease with which it can be transmitted from place to place, and to great distances, with a very small percentage of loss of the initial pressure. It has been carried, through pipes, a distance of four miles, losing only about four per cent. of the original pressure. Where water power can be utilized for compressing air, its cost as a motor, taking into consideration the ease with which it can be carried through pipes, a distance, say, of ten miles, or even more, will make it one of the cheapest and most convenient motors that is known at the present time.

Where steam power is the only means available to compress the air to be used, say on light locomotives for city traffic, where horses have been hitherto used, on elevated railroads, and for hauling of ore in tunnels, for mines, by using engines having a valve motion, adapted to work the air from a very high initial pressure down to atmospheric pressure, the power can be utilized with a degree of economy that cannot be obtained by the best steam motors in present use. For stationary purposes, where light powers are needed for small engines, for driving printing presses, sewing machines, &c., one large engine, running continuously, and charging reservoirs of sufficient capacity, could furnish air as a motor, for such small engines, at a cost less than they can be run at present, with their small boilers, not to speak of the absence of danger from fire, explosion, cost of attendance, and repairs of boilers.

For underground railroads, such as the Metropolitan in London, which has undoubted advantages over the elevated railroad system, such as freedom from danger should the train jump the track, and obstruction of the streets; still the underground system has the drawback of lack of ventilation, which makes it, having to use steam motors, almost unendurable to the passengers. Compressed air as a motor meets this difficulty at once. And at the same time that it propels the cars, gives to this system of conveyance for large cities, the most perfect ventilation pos sible.

There is no question but there is a wide field open to engineers for the improvement of compressed air machinery. When air is compressed in a cylinder, heat is developed, the amount of which is in proportion to the tension of the air compressed, the heat of compression adds to the volume of the air. But this heat has to be got rid of, either by conduction or radiation, and it represents so much work lost; consequently a higher pressure has to be carried in the compressor, in order that we may finally have a given volume at a given pressure, and at the atmospheric temperature. If it were possible to absorb the heat in the compressing cylinders and to transfer it again, to a large extent, to the cylinder in which the compressed air is used and expanded, a very desirable and much sought for end would be obtained.

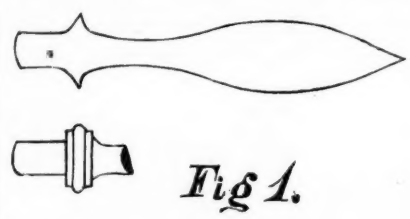


Fig 1.

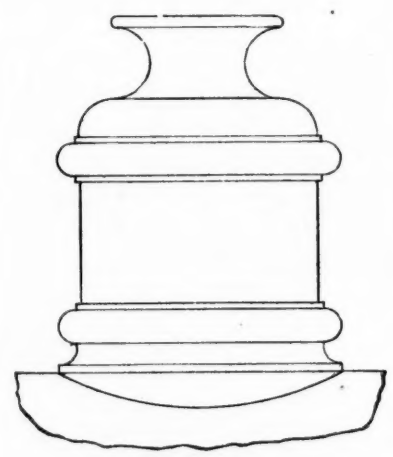


Fig 2.

The Railway Age says: The term "a car load" has come to be about as indefinite as to quantity as the term "as big as a piece of chalk." Formerly a car load meant ten tons; now it means anywhere from ten to sixteen tons, and has become useless and deceptive as even an indication of weight. The Southwestern Railway Association has therefore, very properly agreed that hereafter all freight except live stock shall be rated per 100 pounds instead of per car load.

The Hartford Boiler Insurance Co. publishes the following figures from the reports of its inspectors for August and September, 1879: Whole number of inspection visits, 2,813; whole number of boilers inspected, 5,659—of which 1,866 were subjected to thorough internal and external annual inspections. The whole number of defects discovered was 2,361, of which 569 were dangerous. These defects were in detail as follows: Furnaces out of shape, 153—43 dangerous. Fractures, 194—93 dangerous. Burned plates, 172—50 dangerous. Blistered plates, 397—62 dangerous; cases of sediment and deposit, 272—72 dangerous. Incrustation and scale, 333—44 dangerous. External corrosion, 189—45 dangerous. Internal corrosion, 126—30 dangerous. Internal grooving, 17—5 dangerous. Water gauges out of order, 93—42 dangerous. Blow-outs defective, 28—6 dangerous. Safety-valves overloaded, 39—14 dangerous. Pressure gauges defective, 189—39 dangerous. Boilers without gauges, 113—3 dangerous. Cases of deficiency of water, 8—6 dangerous. Broken braces and stays, 38—15 dangerous. Boilers condemned, 51.

A firm in Westphalia—Koneeke & Behl—a short time ago brought to perfection a new needle-making machine, by means of which 100,000 needles can be stamped and bored in a day of 10 hours. The exclusive right of using it, a German paper informs us, has been acquired by the house of Witte & Co., of Iserlohn, Rhenish Prussia, who are described as the largest needle manufacturers in the world.

There is no patent law in Switzerland—the Swiss finding it more profitable to pirate the inventions of their neighbors and take out patents in other countries than to protect their own. If an inventor patents his process his countrymen will be let into his secret and become gratuitous sharers in its advantages. If, on the other hand, he does not patent it, he runs the risk of being robbed of the fruits of his labor by the treason of a workman or the greed of a friend, in which event his secret would speedily become common property. It is one of the intolerable anomalies of the British Patent law that, while a Swiss may patent an invention and prevent its use in England or demand an oppressive royalty, an Englishman can obtain no protection for his inventions in the Confederation. It is a common thing for Continental manufacturers and others to purchase and patent inventions for the sole purpose of hindering their foreign competitors from profiting by them.

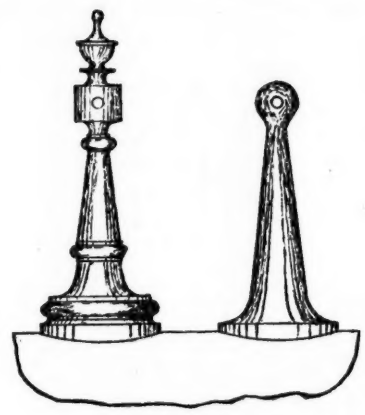


Fig 3.

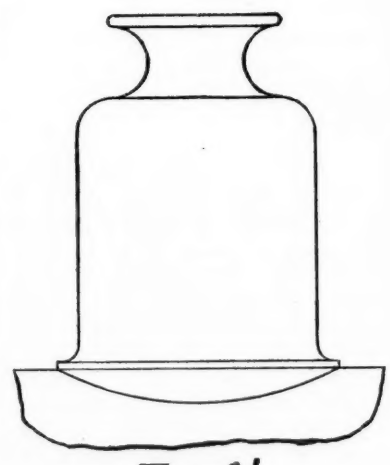


Fig 2'

Chas. Francis Adams, jr., has just issued "Notes on Railroad Accidents," in which he insists on the abolition of the whistle and the system of stopping trains full, at draw bridges as the Connecticut law requires. The machinery by which both draw and grade crossings can be protected is known to railroad men, and is in full use in England. This machinery, which is the electric "block system," provides against rear collisions, tracks broken at draw bridges or at switches, highway grade crossings, and for the notification of agents and passengers at stations.

Machine Finish.

BY F. G. WOODWARD.

It is gratifying to note that machinists are generally adopting plainer styles of finish and ornamentation. They are slowly learning by that best of tutors—Experience, that a smooth surface, whether curved or plain, is the most appropriate for every kind of machinery.

They begin to realize that fine mouldings and beadings, with sharp inward angles, and all useless projections simply for ornament, are but dirt catchers, and a continual annoyance to the tidy operator.

In designing a machine it should not only be reduced to its simplest—best proportion as a whole, but each detail should be so shaped as to present the least and the smoothest possible surface to the eye and to the wiper. Builders of fire engines and locomotives, especially, have something to do in this matter before the wiper's millennium shall come. It is no light job to wipe up a fire engine or a locomotive, with their present elaborations of knobs and corners, after a few hours' use.

It would seem that the severe work and rough usage which is inseparable from the duty of these machines, should at once suggest the most simple and plain finish. A few samples will illustrate. Fig. 1, a pair of handles—Figs. 2 and 2¹, a pair of dome covers—and Fig. 3, a pair of bell posts. The complex style here given is a fair sample of the present practice in this country. This species of elaboration is carried out very extensively on fire engines especially, which, of all others, should be most simply and smoothly finished. The numerous inward angles and fingers-like projections and quirks which has so long characterized the finish of American machinery are entirely out of place, and not in keeping with the otherwise excellence of our machinery. Fine material, fine proportion, fine workmanship, and fine polish; these are the essentials which should prevail with machinists, discarding all superfluities.

I know not what it costs to keep a fire engine or a locomotive, with all of their knobs and quirks clean and bright, but I think it safe to say that more than half of this constant expense might be saved by carrying out the principles suggested by the above comparative samples.

For all large areas, like steam-dome, sand-box, steam-chest, and cylinder covers or mountings, I think that a brilliant drab japan is more appropriate than black; it has a finer contrast with the fine plain polish of steel and brass of the smaller details of the machine.

Advantages of High-Speed Engines.

BY CHARLES T. PORTER.

No. 8.

Your readers are doubtless thinking it is about time for me to explain what my last few articles have got to do with high-speed engineering; and I quite agree with them. Suppose, then, the engine employed for illustration, instead of 50, to make 500 revolutions per minute. But, you cry, that is impossible. Why so? It would fly in pieces. What would make it? First, the centrifugal force of the crank. But we can balance the crank. Well, even if you did, the engine would still shake loose from its foundations before it had got up to half that speed; nothing could hold it. That is very true, and certainly we ought to understand a force that can be so destructive, and see if, when developed in a moderate degree, it cannot be made useful.

Now, the simple little formula we have been considering tells us all about it. We learn from it, for example, that at 500 revolutions per minute, the inertia of the reciprocating parts of this engine would be 100 times as much as it is at 50 revolutions. So the force required to be exerted on the back center, to make these parts keep up with the crank, would be 248.64 times their weight. This would hardly be less than 3000 lbs., making the accelerating force about 350 tons. So it is evidently well to know something about this force before we begin to play with it.

It is quite interesting, as well as important, to know how this force acts to shake an engine on its foundation.

So far as doing work of any kind is concerned, including the overcoming of its own friction, every engine runs in equilibrium; action and reaction are exactly equal. But the reciprocating parts are put in motion precisely as a shot is expelled from a gun, and the engine recoils, just as a gun does. The force of the steam, like that of gunpowder, is exerted equally in all directions. The *vis viva*, or momentum, or work put into the projectile, requires, in the two cases, an exactly equal force, unbalanced, to be exerted against the cylinder head, or against the breech of the gun.

When the crank is unbalanced, its centrifugal force on each dead center coincides in direction with this reaction, and adds to the recoil of the engine.

In a horizontal engine it is possible to balance the accelerating force, however great it may be, in the horizontal direction. To do this, it is necessary, besides balancing the crank, to place, so as to revolve opposite to the crank and at the same distance from the center, a weight equal to the entire mass of the reciprocating parts—piston, rod, crosshead and connecting rod.

The centrifugal force of this revolving counterweight, divided into rectangular components, and the horizontal component, represented, at every point, by the cosine of the angle, which the crank makes with the line of centers, is exactly equal to the force accelerating or retarding the reciprocating parts at that point.

But how about the vertical component? This does not, in practice, give any trouble, as, in one direction, it is resisted by the whole mass of the earth, and, in the other, it is, first, balanced, in some degree, by the opposite vibration of the connecting rod, and then resisted by the weight of the engine, fly-wheel and foundation. It sometimes, however, makes a steam fire-engine jump off the ground.

A curious phenomenon may be observed in an engine that is thus exactly balanced. If free to move horizontally, it will, while running, move backward with a constant motion. The cause of this is found in the fact that, while the centrifugal force of the counterweight is the same on each dead center, the acceleration of the reciprocating parts is, as we have already seen, much more rapid on the back than on the forward center. So, on each back center, the accelerating force preponderates, and, on each forward center, the counter-balancing force preponderates, and these combine into an excess of force, in the backward direction, throughout the whole revolution.

Engines properly constructed, and secured on good foundation, require, however, but little counter-balancing, in addition to balancing the crank, however rapidly, within practical limits, they may be run. The sole office of the counter-weight is to keep the engine quiet, to prevent the recoil above described. It has no other use or function whatever, and it is found that a moderate counter-weight is sufficient for this purpose. If nothing else rises to be first explained, I really hope, in the next article, to say something about the practical use of the accelerating force.

A boiler at the steel works came near exploding yesterday. The person in charge went to dinner and when he returned he found only two inches of water in the boiler. —*Troy Evening Standard.*

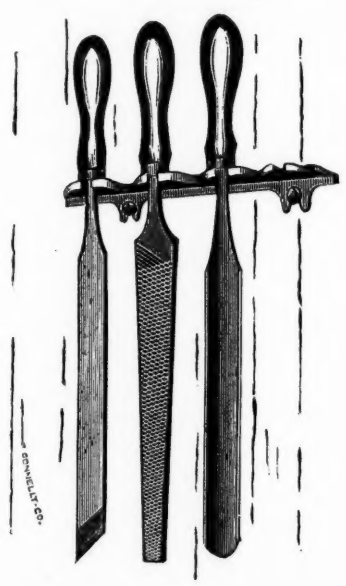
Now if this boiler had exploded, and a jury of experts had examined the ruins, what an interesting and instructive array of scientific theories, and mysterious hypotheses might have been developed for the edification of the public?

Old Iron Rails are being utilized as telegraph-posts on the San Paulo Railway, Brazil. This plan was suggested by the fact that the wooden posts hitherto used were rapidly destroyed by ants. Steel rails are being laid in the place of the iron ones, and at half their cost.

The first four vessels of the Chinese navy were built in England, but the recent additions to the Chinese fleet, armed with Krupp guns, were built by the Chinese, from keelson to cross trees, and the engines were constructed in a Chinese foundry. No less than 15 gun-boats, 11 of over 1,000 tons displacement, have been built in Chinese navy yards. They are pronounced by naval critics abundantly equal to the requirements of active service.

Improved Tool Holders.

The cuts below represent an improved rack for holding files and other tools. It is made of cast iron, and can be screwed up against the wall back of the work-bench, or in any other convenient place. As will be seen by the cut, there is a slot in the front edge of the rack, which allows the file or tool to enter, and a depression, or socket, on the upper surface of rack, into which the ferrule on handle drops. This keeps the tool in place, so that it cannot jar out accidentally, but, by slightly raising the handle, the tool can be readily taken out for use. These racks are calculated to be a great convenience to any one using tools, as they can be kept up off the bench, and still be handy to get at. They are manufactured in several sizes, so as



to accommodate all the common sizes of files and other tools. They are manufactured and sold by Goodnow & Wightman, 176 Washington St., Boston, Mass.

Gleanings from the Foreign Press.

The latest novelty in bicycle appliances is a contrivance known as "The Eucycledian Accelerator," invented and sold by Messrs. Pimtis, of London, England. The proprietors claim that by the use of their patent a bicyclist is capable of traveling at the rate of at least 20 miles an hour with no more exertion than riding ten miles on an ordinary machine. Another feature of it is that hills are more easily ascended, and riding against a strong wind is rendered a pleasure, in place of what, to an ordinary rider, is very fatiguing. Three stoutish rods are fitted inside the driving wheel by means of a brass collar clamped on the spindle. These rods are screwed into the collar, and extend to within 12 inches of the rim of the wheel. At the end of each rod is fitted a diamond-shaped piece of lead, weighing about six pounds, secured by a nut; it thus depends on centrifugal force for its power.—*Design and Work.*

Steel in the Boiler of the Future.—Steel can now be produced by either the "Bessemer" or the "Siemens" process, surpassing in tensile strength and in the power of bending and twisting for flanging, any best brand iron known, the metal produced by either of these two processes being of a purer and more homogeneous nature than can be made by any of the older methods. The best American boiler plate is said to have a rupturing strain of 70,000 pounds, or 31 tons per square inch of section. The ordinary plate for locomotive boilers is stated to be capable of bearing a strain of 60,000 pounds, or 27 tons per square inch. Steel boiler plates, having very great cohesive properties, have been made in England and in South Wales. It is stated to have a tensile strength of 45 tons per square inch, and to be capable of producing the highest class of steam boilers. As a rule, English boiler plates are of two classes—Yorkshire and Staffordshire; these, however, include the make of other districts. The maximum strengths for locomotive boiler plates are as follows: Best Yorkshire iron plates, 25 tons per square inch; best Staffordshire iron plates, 20 tons per square inch; best American iron plates, 31 tons per square inch; ordinary American iron plates, 27 tons per square inch; English steel plates, 40 to 45 tons per square inch.—*Universal Engineer.*

Engines, Machinery, Iron foundry &c.—Business in this branch is very unequally distributed just now. The recent rise in iron, coupled with a slight revival of activity in several of the iron and hardware branches, has certainly stimulated the general demand for engines, boilers, and shafting, but there are two or three large firms here, which have experienced as yet no improvement of trade, and report themselves almost at a standstill for orders. Perhaps the advance of prices—amounting in some cases to 30*s.* or 2*l.* per ton—may have had some effect in checking demand; but if so, one is at a loss to understand why other firms should be engaged up to their maximum productive power on orders of a very miscellaneous character.—*Ironmonger*, Nov. 1.

The cheapest cloth-making country in the world is Switzerland. This is due to the fact that factories are run largely on the co-operative plan. Mills are family concerns, and owners and operatives live and work together. The hands themselves are very often property owners, and have a general interest in the prosperity of the community. As a result, there is a more general spirit of contentment among the Swiss factory-workers than elsewhere in the world. The wages, however, are the lowest, men earning but seventy-five cents and women but fifty.

Letters from Practical Men.

Editor American Machinist:

Much has been written about "steel," its manufacture and qualities for tools, but little has been said about the abuse which steel is subject to from the hands of men who know not its nature.

Bosses of machine and other shops, where considerable steel is used, would be astonished could they see the amount of loss to them in broken taps, dies, reamers, drills and other tools accumulated in one year.

I do not mean to say that tools can be made and hardened that will not break, but I do say fully one-third, especially taps, are broken by being improperly tempered.

There are many shops where no tool forger is employed, and every one who makes a tool is supposed to do his own tempering.

Now let us see how some men will do it. "Billy Smith" will make a tap, and when completed, will go in the forge shop with "lots" of confidence in himself, but little experience in what he is about to undertake.

The first thing he does is to look up a pair of tongs, place his tap between them, put it in a soft, coal fire, and put on blast enough to heat a 4 shaft. "Billy" will then take a seat or go after a chew of tobacco; and when he returns he finds his tap hot enough to be cooled off—yes, up to a nice white heat. Now he plunges it in the water, and in order to polish it up nice he gets a piece of brick or grindstone and rubs it up and down in the flute of the tap several times, with the air of a man who knows his business. He holds it over the fire till the black smoke darkens the polish on it. Being unable to see what temper it is getting, he spits on it, and if it will whiz, he concludes it is about right, and cools it off. Now he goes to tap out his nut; enters the tap in the hole, the end of it (the shank) running out of true about one inch. In about two minutes that tap is in two pieces—one piece in the nut and the other piece in "Billy's" hand. He examines it to find a cause for its breaking. Finding none, he will tell his shopmate that that steel is not worth a tinker's commission, and so it goes. Thousands of dollars are lost in waste of steel and loss of time by men who try to do what they never have learned.

First of all, never heat steel in any fire except a charcoal fire or a lead bath, which give it a uniform heat (I mean steel tools of any kind). Rain water is the best water for hardening, as it contains less lime than either well or river water. Water should never be very cold for hardening tools, as the sudden contraction of the steel will cause it to crack, more especially in cutting dies where there are sharp corners.

To insure thorough hardness, salt should be added to the water until the same becomes quite brackish. The salt will cause the water to take hold of the steel and cool it off gradually. I find rock or fish salt to be best, though table salt will answer. The salt is also beneficial to the carbon in steel. For removing scale from steel when put into water, ivory black should be used, putting it on the steel while it is heating and letting it remain till the steel goes into the water.

In tempering taps, reamers, twist drills and other like tools, great care should be taken to put them in the water in a perpendicular line, and slowly, not allowing them to remain stationary in the water as there is danger of there being a water crack at the water line.

A good way to draw the temper is to heat a collar or any suitable iron with a hole in the center, and draw the tool backwards and forwards through it until the right temper is obtained, which will be uniform.

Now, Mr Editor, I do not write this article for the benefit of first-class tool makers, for any first-class tool maker is also a first-class temperer of tools, but I hope it may come under the eye of some such men as I call "Billy Smith," for there are lots of such men. Respectfully, A. PHELPS.

Newark, N. J.

In the present issue the subject of Compressed Air and its advantages as a motor in peculiar situations is continued by John Fish, M. E., who has had several years practical experience in planning and building air compressors, and applying compressed air as a motor to various kinds of machinery. The increased attention now attracted by this subject will make these articles of especial interest to a wide circle of our readers.

Some feeling is again being awakened in reference to the practicability of establishing a locomotive works in St. Louis. Nothing definite, so far as is known, has been accomplished, though a considerable amount of reserve feeling on the subject has been awakened. The location is believed to be most desirable and well adapted for such an enterprise.—*St. Louis Jour. of Commerce.*

There is a very brisk demand for American harvesting machinery in Australia and the New Zealand islands.

A strike has occurred among the hands of Meyer's Rubber Works, Milltown, N. J. The female hands demand an advance from 2c. to 2½c. a pair. The male boot makers demand 12½ per cent. advance on present wages. They claim that, at present prices, they cannot average more than 75c. a day.

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Checking the Wages Advance.

One of the first effects of our firm-footed business revival was to increase the demand and use of all classes of goods; another, following close upon it, was to raise the price of many commodities, the net result being the employment of most idle working-people, the circulation of hoarded money, and the giving of life and prosperity to all legitimate industries. Mills and workshops, whose machinery had grown rusty and cobwebbed, through years of solemn stillness, have been swept and garnished, and the hum of looms, and wheels, and tilt hammers, and lathes, and presses, and the joyful screech of the steam whistle, resound where a mournful quiet reigned a few short months ago. Shops are working full-handed and overtime, and rates of wages keep moving upward.

This transformation is lifting workmen, by thousands, out of the deplorable condition of delving unceasingly for the bare necessities of life to a higher, broader and nobler plane of existence. They are beginning to enjoy better homes, better furniture, to wear better clothes, set a better table, and to surround themselves with more of the elevating influences of good books and periodical literature. Every consideration of sound political, social, moral, or domestic economy would seem to call for a steady continuance of this long-hoped-for progress. Every consideration of philanthropy and patriotism would seem to impel the whole press and the public to lend it aid. There is nothing, in the present condition of affairs, to threaten a reaction.

But stop! The notes of warning to workmen are even now being sounded by some of our exchanges. One of them views with alarm the unsettling of the wages question (that is, advances in wages), and takes occasion to point out that its continuance would produce "a result that not only endangers the harmony that should exist between labor and capital, but would also be fatal, in many cases, to our export trade." We must here explain that, by "capital," these astute publications do not refer to our active and whole-souled managers of honest industrial enterprises, but a species of porcine biped, who does no real work, yet manages to absorb about two-thirds of all the productions of manual labor. The insatiate appetite of this zoological specimen makes him very obstreperous in seasons of abundance, and a certain portion of the press seem commissioned to see that it is measurably appeased. He is "harmonized" only by the persistent pinching of honest labor. It is noticeable that many would-be "moulders of public opinion" can see into a question like this only just beyond their noses. Our export trade in manufactured goods has been built up mainly because of a much-restricted home market. With a light demand near by the sources of production, enterprising manufacturers sought and obtained markets abroad. As a rule, sales of goods for export are made at lower figures than for home trade, and, since a good demand now exists without going to foreign countries, no great efforts are needed in that direction. But the export trade has been rapidly increasing, and advances in prices of American goods will lead to advances in prices of foreign goods that come into competition; so that not only our own manufacturers and workmen receive a benefit, but those of many other countries.

The same paper from which we quote dreads the recurrence of such times as, took place at some previous date, probably in the period introduced by our late civil war, "within the memory and experience of many, when wages were higher than ever known before, or since," because the workmen manifested a spirit of independence. We may, from this time, expect a vigorous crusade against any higher wages, by the advocates of that great economic principle that workmen should be paid only enough to barely sustain themselves and families, thus preventing their rising above their station. The promoters of this movement are likely to be sorely disappointed.

The Advantage of Going Slow.

Right here a word of caution may not come amiss to those mechanics, whether working for wages or not, who have been pinched by the hard times of the past few years, and who now find themselves enjoying an increased income, as a result of the revival of business.

No one is able to realize more forcibly than this large class the perils and discomforts through which they have passed, and none should attend more closely to the ways and means needed to render their recurrence impossible. Any man who has found those near and dear to him forced, by the reduction of wages or loss of employment, to seek shelter in a squalid and unhealthy habitation; to live upon insufficient, or unwholesome food; to face the seasons poorly clad; to lose the benefits of early school training, or to associate with undesirable companions, has had an experience that should be a warning and guide to him for all time to come.

The manufacturer who has found his business destroyed by the introduction of new methods, or by any one of a great number of possible changes of circumstances, in getting squarely upon his feet again, must do so with a lively sense of dangers past, and, if a thinking man, a solid determination to do all that in him lies to prevent future voyaging in that boat.

To all such, the suggestion *Go slow* should come home forcibly in these days of prosperous outlook, so far as spending money is concerned. Every week or every month should see some specific, even if small, sum inflexibly set apart for the rainy day, that, though not now imminent, may, and probably will, come again some time. Even if hard times are not repeated, sickness and age are certainties, and should be provided for.

The importance of having a little capital, also, to fall back upon in future business emergencies, cannot be overestimated. The opportunities which the system of co-operation seems likely to offer to American workingmen within the next few years, should not be lost sight of in this connection. If half the money that has been wasted in unsuccessful strikes in this country, during the past ten years, had been safely hoarded and prudently invested in co-operative enterprises by the men who have an interest in their good management, it is safe to say that tens of thousands of homes, that are now bare of home comforts, would present a brighter aspect than they do, even in the brightening sunlight of to-day. The consideration of the various methods of saving and investing small sums of money may properly be deferred to some future occasion.

A Pittsburgh trade paper gravely informs its readers that there are *fifteen thousand* steam engines in that city and the other portion of Allegheny Co. What rapid strides have been made in the use of steam power within nine years! Let's see. The U. S. census of 1870 records the number of steam engines in Allegheny County, Pa., as 595. An increase of over 2500 per cent. in nine years ought to be very gratifying to the inhabitants of the Smoky City. In 1870, the whole State of Pennsylvania had 6,230 steam engines, aggregating 231,936 horse power; New York had 4,664; Ohio, 4,586; and the States of Massachusetts, Michigan, Indiana and Illinois each had over 2,000 steam engines. Missouri and Kentucky each had over 1,000. All the other States fell below a thousand each. New York City summed up, according to the last complete census, 1,261 steam engines, with a total of 28,716 horse power; Philadelphia, 1,611, with a total of 40,528 horse power; and Kings Co., N. Y. (embracing the city of Brooklyn), 286 engines. The whole United States gave a total of 40,191 steam engines, with 1,215,711 horse power, and 51,018 water-wheels, with 1,130,431 horse power. But we forbear firing any more statistics at our readers. We have a suspicion that a *few* of the fifteen thousand engines first mentioned are children's toys.

Chordal gives, in his letter this week, the results of some philosophical and practical observations upon lighting machine shops for night work. The electric light seems to meet the requirements exactly, enabling the workman to operate, probably, as well as by sunlight, but its expense is a serious objection. The electric light not only costs largely at the outset, but constantly requires a considerable expenditure of power. The public have come to expect too much of Prof. Edison in this direction, especially as regards cheapening the light. A steady, uniform and reliable light of the desired intensity is the first thing to secure. The next thing is to make it cost as little as possible. Most of the electric lights we have observed are unsteady, though brilliant enough, at intervals. For large machine shops, iron mills and mines, where extensive work is carried on, the electric light has become very popular, but, for small establishments, its cost is, and probably will remain, a barrier.

The striking stove moulders of New Albany, Ind., propose to go into business on the co-operative plan. This resolution is much wiser than that which led to the strike. When a body of workmen feel that they are not receiving a just recompense for their services, and cannot, by ordinary reasoning, persuade their employers so, the best course, in every practicable situation, is to form a co-operative association, and go to work on their own account. They may, in some cases, fail, after running a short time, but a failure should not weaken confidence in the co-operative principle, for business conducted on this plan is subject to the same vicissitudes as individual enterprises. Co-operative stove foundries have succeeded well in several of our manufacturing towns, and some of them have been running a number of years. There are many other kinds of manufacturing that have succeeded on the co-operative plan, and branches yet untried would, doubtless, result as well. It is one of the most satisfactory remedies for strikes that can be applied.

Mr. Chas. E. Harris called at our office a few days ago on his departure for Silver City, New Mexico, with $40,000 worth of improved mining machinery made in New York and Boston. The machinery will be set up by Capt. John H. Carter, manager of a large mining company in Silver City, from whom our readers may expect to hear something as to the results obtained.

We present, as usual, this week a number of valuable practical articles, some of them with illustrations. The designations and standards of bolts, nuts, screws and rivets are treated by Mr. John E. Sweet, on first page. This article, with the illustrations, would save a vast amount of time and trouble if it were posted up conspicuously in every machine shop in the land. Mr. Samuel E. Webber gives the first of a series of articles on turbine water wheels, which, considering the ability and practical experience of the author in this department of engineering, will doubtless be read with much interest. Mr. H. L. Stellwagen, of Philadelphia, explains the method of putting shafts in screw vessels, and the timely subject of machine finish is discussed briefly by Mr. F. G. Woodward of Worcester. Mr. Chas. T. Porter gets down to a direct appplication of his "Advantages of High Speed Engines," the ground for which he has broken in previous issues. Mr. Park Benjamin gives some telling thrusts to the authors of the major portion of trade catalogues and circulars, and Mr. John Fish, a very competent authority, gives the second article on Compressed Air, one of the live mechanical topics of the day. Mr. Wm. H. Hoffman continues his articles on Boiler Proportion and Construction, which have been very well received.

The new department, "Letters from Practical Men," which was recently started in our columns, has met with such marked appreciation, as shown by the many com-

mendations that are constantly reported to us, that we regret having only one letter, which is suitable for this heading, in this issue. We will gladly find space for short practical communications upon any one of the ten thousand points that are constantly coming up in everyday shop practice. We daily receive a great number of letters commending the character and conduct of the AMERICAN MACHINIST, and such testimonials are, of course, very gratifying, though they do not fall within this special province. As an example of topics that may be properly treated in this connection, by men who know how to do the work, we might instance practical methods of tempering, not only steel tools, but steel for other purposes. Forging, blacksmithing and pattern-making would also interest a great many readers, benefitting not only those who read, but those who write upon these topics. Half the value of such written articles lies in their suggestive qualities, as an inducement to further thought, and this is a gain common to both writer and reader.

Friendly Comments.

(*From the Boston Journal of Commerce.*)

AMERICAN MACHINIST.

This paper just opens upon its third year, with a circulation of 9000 copies. It is full of sensible matter, and practical to the fullest extent. Its pages are well illustrated with improved mechanical productions, and its advertising patrons are a class who know what is a credit to them. We are glad to see a journal that is fearless, and untrammelled by any connection with side issues or interests, and as a practical engineer we give it our hearty approval.

(*From the Troy Evening Standard.*)

The AMERICAN MACHINIST begins its third year with the current number. It has attained unusual popularity among mechanics, because it combines the latest information regarding the progress of purely physical science with an advocacy of the truths derived from social science. It explains their practical bearing on human affairs, and is every way a first-class journal.

(*From the Hebron (Neb.) Journal.*)

One of the most useful and entertaining publications we find upon our exchange tables is "THE AMERICAN MACHINIST," a journal for machinists, engineers, founders, boiler makers, pattern makers and black-smiths, and scientific people generally. It stands deservedly high as a standard publication, and is alike creditable both editorially and typographically. It is published weekly by the American Machinist Publishing Company, 96 Fulton street, New York, at $3 per annum.

(*From the Furniture Trade Journal.*)

The AMERICAN MACHINIST is an iteresting and valuable paper, not only to those for whom it is especially published, viz., machinists, engineers, founders, boiler makers and blacksmiths, but to all who are at all interested in machinery. It gives the latest inventions and improvements, and contains much interesting matter aside from its specialty, for it is true that one art or one industry connects itself nearly or remotely with every other. It has a wide range, and understands how "to cultivate the particular field of its labor so that it may gather from it the best crops for its subscribers." We find it a valuable exchange.

(*From the Pioneer, San Jose, Cal.*)

We have received copies of the AMERICAN MACHINIST, published at New York by the American Machinist Publishing Company. It is devoted to the publication of scientific matter in every department, full of excellent illustrations of machinery, and is a paper that should be in the hands of every mechanic. Its columns are alive with interesting reading both for young and old. It has very lately changed from a monthly to a weekly, thus adding materially to its usefulness. It is published at the very low price of $3 per annum, and is therefore within the reach of all.

(*From the American Journal of Industry.*

THE AMERICAN MACHINIST, one of our most valued exchanges, has just entered upon its third year, and, we are glad to know, with every prospect of substantial prosperity. The MACHINIST has achieved a brilliant success by deserving it. No progressive machinist, master or man, should be without it.

Machinery Rhymes.

There was a machinery vender,
Whose conscience was not at all tender;
One morning he sold
A boiler so old,
It burst on his premises, though it was cold,
And demolished its patcher and mender.

There was a machinery user,
Who considered himself such a chooser
Of things good and true,
That he thought it would do
To buy an old boiler and paint it up new—
So now in his grave he's a snoozer.

There was a machinery maker
Who valued his skill by the acre;
Into paper or book
He never would look,
So was forced to sell out and be deputy cook
In the shop of a gingerbread baker.

There was an improvident moulder,
Who thought he should never grow older,
So he frittered away
Sixty years and a day,
When he courted a wife, but she answered him nay—
And he dashed out his brains with a boulder.

There was a new-pattern designer,
Who fancied his patterns were finer
Than man ever made,
So he chartered a spade,
And dug a hole straight through the earth with the blade,
And came out as an idol in China.

There was a machinery writer,
Who became such a weighty inditer
That he told all he knew
In a sentence or two,
And then, when his knowledge had all trickled through,
Went West as an Indian fighter.

There was a machinery stoker,
Who tried to set up as a joker
But the first witty note
Stuck fast in his throat,
For the public compelled him to eat all he wrote,
Which stiffened him out like a poker.

LITERARY NOTES.

THE ECONOMY OF WORKSHOP MANIPULATION.—A Logical Method of Learning Constructive Mechanics, Arranged with Questions for the use of Apprentice Engineers and Students. By J. Richards, author of other works on Mechanical Subjects, Wood Working Machinery, etc.; crown octavo, cloth, price $2.00. Published by Richards & Atkinson, 615 Walnut street, Philadelphia, Penn.

The above book consists chiefly of a revision of a series of articles published in "Engineering" and the Journal of the Franklin Institute, under the head of "The Principles of Shop Manipulation" during 1873 and 1874. The articles alluded to were suggested by observations made in actual practice, and by noting a "habit of thought," common among the learners, which did not seem to accord with the purely scientific manner, in which mechanical subjects are now so constantly treated. These articles have been reproduced in the form of a book, thoroughly revised, with important additions on mechanical subjects—and of use to the practical man—one of which is the annexing of a few questions at the end of each chapter, which adds greatly to the value of the work.

One important point taken is the fact that although workshop processes may be scientifically explained and proved, they must nevertheless be learned logically. This view, it is hoped, will not lead to anything in the book being construed as a disparagement of the importance of theoretical studies. Success in technical training must depend greatly upon how well the general mode of thought among learners is understood and followed.

There are few books, among the many now published, that are a real help to apprentices, although many profess to be such. The great and essential points required in the practice of mechanics is the power of analyzing and drawing conclusions from common practice. This work gives some very practical ideas as to the natural qualifications and the necessary studies to pursue in order to succeed in mechanical engineering. The money value of mere theoretical training is clearly shown, and the student is taught that the text book is a secondary consideration to an attendance upon illustrated lectures and practical tests.

We notice a little extract from an address of Prof. J. E. Sweet, late of the Cornell University, delivered to his class, which contains a world of meaning, viz.: "It is not what you know that you will be paid for; it is what you can perform that must measure the value of what you learn here." These few words are worthy of the consideration of every student and apprentice, and are thoroughly practical. The plans of studying are well taken, and deserve a careful examination, while the varieties of engineering are separated into their proper divisions. There are some very excellent ideas in regard to the manner in which the apprentice system is affected by the numerous improvements in machinery.

The objects of machinery are fully explained, together with the different branches, viz.: Steam engines or motive machinery, water power, wind power and transmitting machinery; embracing shafting, belts and gearing, together with hydraulic apparatus and pneumatic machinery and their applications. Some suggestions are offered on handling machinery, and the proper appliances; also the combination of different functions in one machine. An important matter is the arrangement of shops and shop processes which is very fully described, also mechanical drawing, pattern making and casting, and, in fact, all the different branches of operations and processes usually encountered in machine shops. The system of gauging and measuring implements should not be overlooked, nor the chapter on workshop experience, as they are of interest to every practical man.

Business Specials.

Forty cents a line for each insertion under this head.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Lathe Attachments for Milling Plane and Irregular Forms; Taps and Reamers fluted and Gears cut without removing from the lathe centers. For extended description, see AMERICAN MACHINIST, Sept. 13 and 20 issues. Send for circular to Wm. Main, Piermont, N. Y.

Tool Chests with best tools, scroll saws, wood and designs. Amateurs' and Machinists' Tools. Send for Catalogue. Tallman & McFadden, Philadelphia.

Calvin Carr, Cleveland, O., and 44 Centre Street, New York, Galvanized Iron Cornice Machinery,

12 Plain Milling Machines, improved pattern, weight 1,400 lbs. each, just finished and ready for immediate delivery. Brainard Milling Machine Co., Hyde Park Mass.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) H. C., Cleveland, Ohio, writes: Can you give me the receipt of a cement for sticking two pieces of tin or iron together? A. You do not state how strong the cement should be, or for what articles you desire to use it, but we give you the following, which is very good for smooth surfaces, viz.: Melt in a water-bath liquified glue 5 parts, copal varnish 15, drying oil 5, oil of turpentine 2, turpentine 3; add slacked lime 10 parts.

(2) J. R. F., Westchester, N, Y., writes: Will you be so kind as to give me the correct name of the lever attached to the reversing rod of a locomotive? An engineer said in the course of an argument with me that it was the reversing lever, and I argued that it was called the reversing gear. Will you please settle the question? A. The reversing gear is understood to be all the parts which go to make up the device used for reversing an engine, whereas the reverse lever is the name used to designate one of those parts only, for example, as the reach rod, lifting shaft, etc.

(3) R. C., Richmond, Ind., writes: Will you please answer the following: Does an increase of speed of an engine increase its power as indicated by the dynamometer? Of course it would if the shafting it was driving was geared down to its former speed, but that is not the question, steam pressure is constant. A. The power of an engine increases as a direct ratio of the velocity of the piston. For illustration, take an engine with a cylinder 20 in. diam., and 24 in. stroke, running at a velocity of 50 revolutions per minute, with a mean effective cylinder pressure of 30 lbs.. Then the area of piston multiplied by 200, the velocity of piston in feet per minute, and that product divided by 33,000, the equivalent of one horse-power, and the quotient multiplied by 30, No. lbs. mean effective pressure will give a result of 27.810 H. P. Now take the same engine, all other things being equal, with a velocity of piston of 400 ft. per minute, and the result will be 55.620 H. P., and as a third example, take a piston velocity of 600 ft. per minute and the result will be by the above rule, 83.430 H. P. Gearing the shaft down would make no difference as the indicator is to be placed on the engine to ascertain the actual developed H. P.

(4) J. A. M., Pawtucket, R. I., writes. 1. Will you please explain the piston balance valve for steam engines, and are they durable and economical? If they are, why are they not more extensively used? A. The most successful piston valve now in use is a solid valve, without packing rings, cored out inside to make it light. It is fitted to the hole in which it is to work, by being turned and finished by grinding, in order that it may move freely through the hole without binding. Great care and skill are necessary in order to make a successful working valve, which will not leak. The piston valve is economical, as it is perfectly balanced, and, in regard to its durability, we would say that it has been successful chiefly on vertical engines and steam hammers, but there are objections to its use on horizontal engines, in some cases, as it wears most on the bottom side, etc. 2. I want to build a compound engine, high pressure cylinder 7 in. x 8 in. and low pressure cylinder 13 in. x 8 in. What size steam openings must be in cylinders for balance piston valves, and what size must the piston valves be? Engines to run 175 revolutions. A. The area of steam ports of high pressure cylinder should be not less than 2¼ in. 3. What should be the diameter and stroke of the air pump? A. It should be about one-fourth the capacity of high pressure cylinder. 4. Would you recommend the coil boiler? A. No. 5. How many square feet of heating surface will be required, and does the coil boiler require as much grate surface per horse power as the tubular boiler? A. Allow about 15 square feet of heating surface per horse power, and for every 30 square feet of heating surface allow one square foot of grate surface. We advise you to use an upright tubular boiler, as the coil boiler is still a matter of experiment. 6. Would a stack 9 feet high be right for burning stove coal with a natural draught? A. Yes; but we would advise the application of a blower in case of emergency. 7. Please give me the rule for laying out the link motion and length of link. A. This question would require an article to explain the process in all its details, and would therefore recommend that you procure a copy of a book on Link and Valve Motions by Archincloss, price about $3.50. 8. I want to use the above in a steam yacht 50 feet long and 11 feet beam, draught of stern 4 feet, diameter of propellor 42 inches, pitch 75 inches, pressure of steam 90 lbs. A. The engines, if properly proportioned, will give you plenty of power for a boat of the given dimensions, and ought to give good results.

MANUFACTURES.

A bag factory is contemplated at Janesville, Wis.

The Pierce Mills at Valley Falls, R. I., is to be built at once,

The new flouring mill at Milwaukee will cost about $80,000.

The new brick factory of B. F. Spinney at Lynn, Mass., is now in progress.

Wallace & Sons, of Ansonia, Conn., are building a new brick factory 200x40 feet.

T. T. Greenwood is about to build an addition to his furniture factory at East Templeton, Mass.

American manufacturers ought to have a good showing of their best labor-saving machines in the coming industrial exhibition at Buenos Ayres, which is principally designed for the exhibit of machinery, agricultural and other kinds, suitable for the requirements of South America.

The Willimantic (Ct.) Linen Company have bought a mill privilege in township No. 8, Maine, range 8, "Howard," so called, and expect to put up a mill there. The Springvale Mill Company will build a new mill, giving employment to 200 people.

On a recent visit to Syracuse, we noticed great activity at the works of the Sweets' Manufacturing Company. They are receiving about 250 tons a month of old Bessemer rails from foreign sources, beside large quantities of Bessemer steel rail ends and ingots from the mills in this country. By several passes through specially-formed rolls, the rail ends are reduced to flat bars; and the old rails, cut into 8 or 10 ft. lengths, are, when heated, passed through a pair of rolls, and split into 3 pieces each. Different kinds of steel goods are manufactured from this stock, such as wagon tires, sleigh shoes, crow bars, harrow teeth, spring steel, &c. The greater part of this spring steel is used up on the premises, where 550 pairs of seat springs are made per day.

They use 6 engines, 4 trains of rolls and 3 steam hammers beside the special machinery. All the heating in this mill, from the least to the greatest, is done in William A. Sweet's gas furnace. In these furnaces the hot gases from the fire and the hot air mix at the mouth of the heating chamber, very like the Siemens' furnace, but the gases produced in the fire-box of the furnace, which is like a common reverberatory furnace, except that the coal is forced into the fire by a plunger, which forces the fuel in below the bottom and above the top.

After a tour of the shop, we visited the basement and were shown John E. Sweet's "Pet." This is an entirely new type of an automatic cut-off steam engine, which we intend to describe, with an engraving, in some future issue. The many friends of Mr. Sweet will read the description with especial interest. The most striking peculiarity of this engine is its simplicity. We saw it running on the floor, without any other foundation, at a velocity of 210 revolutions per minute, as smoothly and unconcernedly as though bolted to a foundation of granite. The governor controlled the engine so perfectly that when the brake was applied, requiring the engine to take steam for a full stroke, and then the brake removed, the engine would not make over two revolutions before the governor would shut off sufficient steam to regulate the speed. A 150 H. P. engine, possessing the same kind of valve, valve motion and governor, is being built to run a train of rolls direct, at 250 revolutions per minute. This engine, which is of the joint design of W. A. and J. E. Sweet, possesses some novel features in detail. If they prove successful, we shall be likely to hear from them in "Bits of Experience," and, if they do not, we shall be equally likely to hear from them in the same way.

The Holly Water Works Co., Lockport, N. Y., have a new contract to furnish two sets of pumps and machinery for Oskaloosa, Iowa. This, with other contracts on hand, will afford plenty of work until Spring.

The Car Works are building a new blacksmith shop fronting on Main street, 110x25. The firm will take up the whole lower part of the town if they keep on making additions.—*Beaver Falls (Pa.) Enterprise.*

The old Paper Mill at Beaver Falls, Pa., has been purchased by a firm of gentlemen from Latrobe, Pa., who intend renovating it and making great improvements.

The mills in Eastern Connecticut are stopping for lack of water.

Calvin Carr and associates have started a factory at 44 Centre St., New York, for making a new non-corrosive white metal, for which peculiar advantages are claimed. Saddlery hardware is now being made of it, and other uses are expected to follow.

The total capital stock of the new Pittsburgh Bessemer Steel Co. is $250,000. The board of managers consists of W. H. Singer, Chairman, C. G. Hussey, C. C. Hussey, Wm. G. Park, Wm. Clark, Reuben Miller and Andrew Kloman. The site for the new mill has not yet been selected.

The Billings & Spencer Co., Hartford, Conn., employ 75 men, and have orders for six months to come. They will soon place on the market some new specialties.

Superintendent Jones, of the Edgar Thomson Steel Works, near Pittsburgh, says: "We have about 1,200 persons on the pay-rolls, about 150 of whom are boys, and of the balance nearly 400 are laborers. In the face of all this, the pay-rolls for each of the last ten months show that the employees average $52 per month each. That is good pay. Further, we pay cash every month. If we are not satisfied with a man, we give him three days' notice, and if a man desires to leave the company he gives us three days' notice. Our relations are very pleasant with the men."

Machinists' and Engineers' Supplies.

NEW YORK, Nov. 13, 1879.

The market continues to a great degree bare of novelties, though a good business is being done in regular goods. Manufacturers, as a rule, have little time to give to experiments or new articles.

Persons who are in a position to know, express themselves as absolutely certain that there will be an early and marked advance in the prices of the regular trade machine screws, nothing but a Kilkenny cat fight between two leading manufacturers having delayed it so far. Now these two are said to be getting ready to embrace, and whisper vows of love, and all that sort of thing, while the public pays the bill.

A great scarcity of ½ inch Stubs' steel is reported in this market.

Some dealers think twist drills are about to catch the "boom," but the weight of opinion seems to favor maintenance of the present prices, on the ground that the makers can show no good reason for advancing.

We quote the present prices of oil stones in this market: Large size, Arkansas, $1.35 per lb.; Washita, 50 cents.

The general run of Machine Tools, which have not yet advanced at all, well informed parties, both manufacturers and dealers, say, arecertain to go up in price, the probable date being on or about Jan. 1, 1880. If the prices of Iron and Metals should recede to any marked extent, which does not appear very likely, the advance may be delayed somewhat, but it is bound to come. It will be remembered that the decline was slow to take effect in these tools, and naturally they would be among the last goods to feel the upward lift, but the stocks of second-hand tools have been diminishing, and, in the face of an increased cost of labor and material, matters cannot long remain as they are. The consumer who wants to buy a lathe or planer, or anything in the machine tool line, will certainly not lose anything by buying now, and is pretty safe to gain.

Wrought Iron Pipe is now quoted at 25% discount.

On Dec. 15, the 7-inch size of Hall's Patent Cutting Nippers (Peter A. Frasse & Co., New York, sole agents), will be on the maket, orders for 180 dozen of this single size being now on the agents' books, waiting for the goods. The telegraph companies are adopting this size for their use in handling wires. Some of our prominent politicians, who want efficient wire-pulling instruments, would do well to examine this tool. The same parties are bringing out what they call the Interchangeable Hand Vise, a new tool, adapted for the use of machinists, jewelers, and others who require a hand vise. The new vise is said to be superior to Stubs' and much cheaper. Regular sizes will be made, but prices are not yet fixed. The new store of Peter A. Frasse & Co., 95 Fulton St., will be handsomely fitted up and ready for occupancy the latter part of November.

In consequence of the advance in metals, oilers have been advanced; Wallace & Sons quoting Tin and Zinc, discount, 50%; Brass and Copper, 40% to the trade.

Bench Planes are now quoted at discount, 30% to 40%, discount according to quality; Plane Irons, 10%, all subject to an additional discount for cash.

Iron Review.

NEW YORK, Nov. 13, 1879.

The demand still continues very good, and orders are placed with great difficulty at our mills here, whose capacity seems still to be taxed to the utmost, and very few of whom have yet wiped off all orders taken at the old prices. There seems therefore no disposition on their part to make any concessions, and, when in the market, the prices they will have to pay for raw materials preclude the idea of any fall from present figures. Many have thought that, owing to English competition, prices here would very materially fall off, but the advances on all grades of Iron and Metals have been so considerable on the other side, and prices there are still so decidedly upward in their tendency, that we think this apprehension is in a great degree unfounded. What Iron is bought at low prices on the other side, before recent advances, will be readily absorbed here. Boiler Tubes are now quoted at 10% to 15% discount, according to quantity bought and credit of customers.

Pierson & Co., 24 Broadway, New York, report prices as follows out of store:

Boiler makers' supplies: Tank Iron, 4½c.; C. No. 1 Boiler Plate, 4¾c.; C. H. No. 1 ditto, 5c.; Best Flange ditto, 6c.; Boiler Rivets, 5 to 6c.

Other Iron Supplies: No. IX Pig, $30 to $31 per ton; Iron Rails, $46 to $55, according to weight; Old Rails, $31.50 to $32; Fish Plates, 3c. per lb.; Railway Spikes, 3½c.; Bolts and Nuts, 4½c.; Common Bar Iron, 3c., basis from store; Refined, 3 2-10c., basis; Ulster, 3 8-10c., basis; Machinery Steel, 7c.; Best Tool Steel, 12½c.; Norway Bar Iron, 5½c.; Norway Shapes, 6c.; Nail Rods, 6 to 6½c.; Sheet Iron, 4½c., basis; Angle Iron, 4c.; Tee Iron, 4½c; Band Iron, 3 6-10c.; Hoop Iron, 3 8-10c.; Horse Shoe Iron, 3 8-10c.; Hot Polished Shafting in lengths, 2 ft. and longer, 7 to 8c., according to size; Small Black Rivets, 50% off in papers, 35% off in bulk.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of Nov. 13th, 1879:

Owing to recent arrivals of Pig Tin, and a more quiet market, prices have receded from last quotations. If stocks are not unduly pushed, the market will take care of itself, and gradually consume all spot lots, and early arrivals. London quotes Straits Tin, £91 per ton; Singapore, $27.80 per picul. Would quote to-day, Banca Tin, 25c.; Malacca and Straits, 22¼c. nominal; Billiton and Australian, 22c. to 22⅜c.; "Lamb and Flag," 20½c.; Pig Lead strong, with present available supplies light, quote 5⅜c. to 5⅝c.; Antimony steady, Cookson, 17c. to 18c.; Inferior brands, 16c.; Western Spelter, 6⅛c. to 6¼c.; Imported "S S," 6¾c. to 6⅞c.; Ingot Copper, strong, 21¾c. to 22c.; Nickel, $1.25 to $1.50. Bismuth, $2.50; Solder, No. 1, 12c.; "Half-and half," 13¾c. to 14c.

Situations Wanted—Help Wanted.

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Situation as superintendent of machine shop. Have had over 25 years' experience with all kinds of machinery. Best references. Address, W. H. B., office AMERICAN MACHINIST, New York.

Position with first-class machinist, to finish the machinist trade, by a young man with one year's active experience on general lathe work. Best of reference. Address, stating particulars, F. D. Baker, Wilmington, Illinois.

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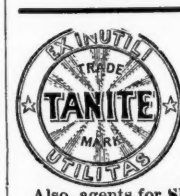

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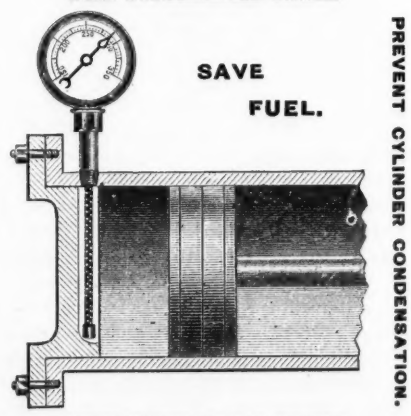

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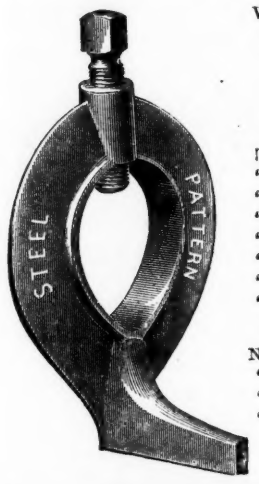

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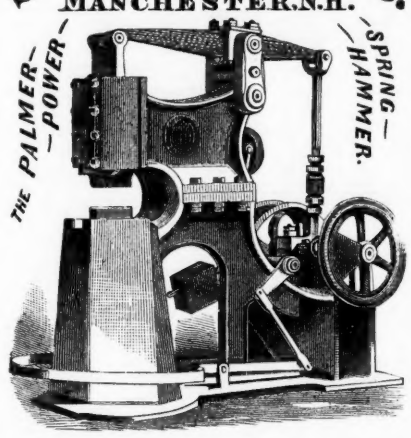

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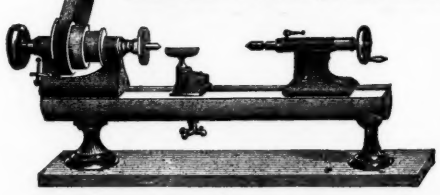

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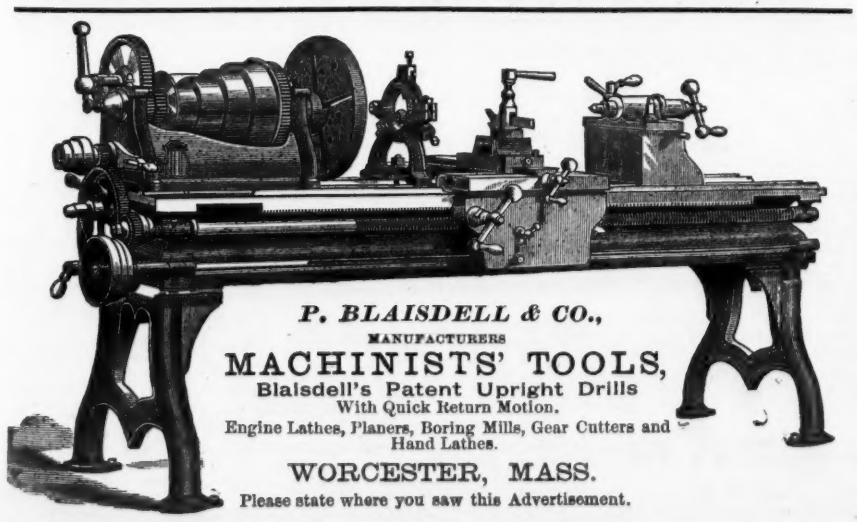

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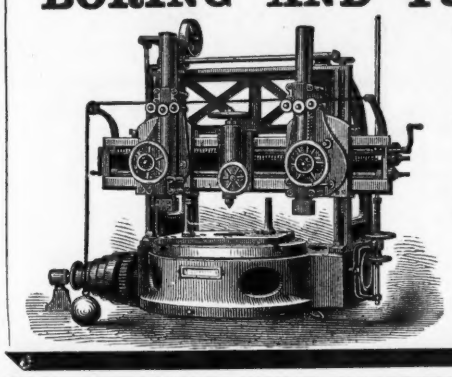

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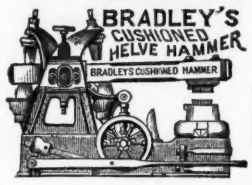

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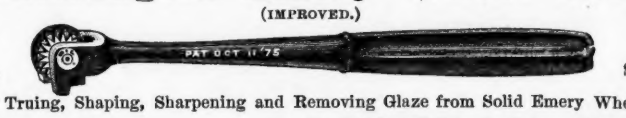

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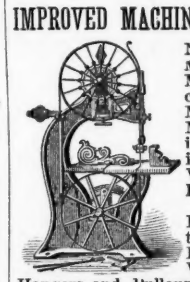

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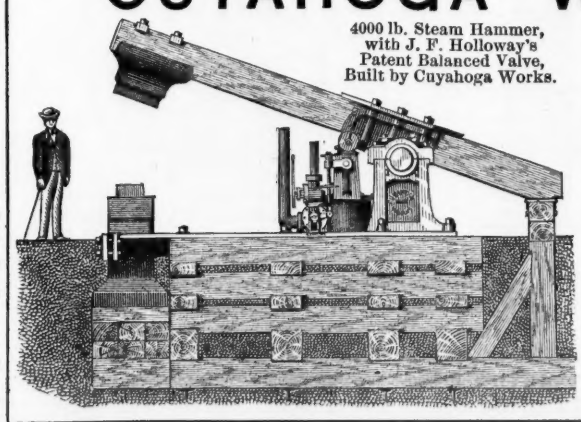

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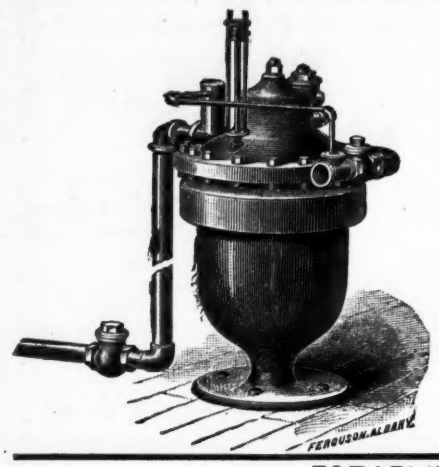

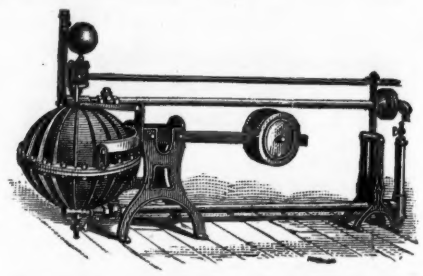

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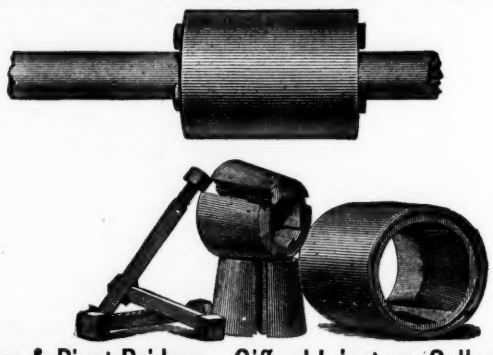

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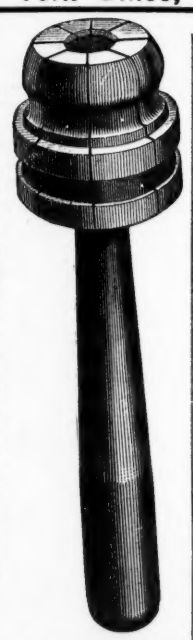

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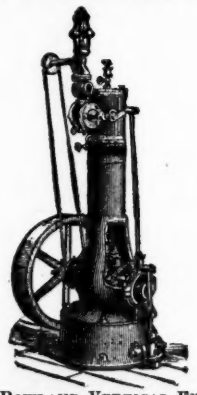

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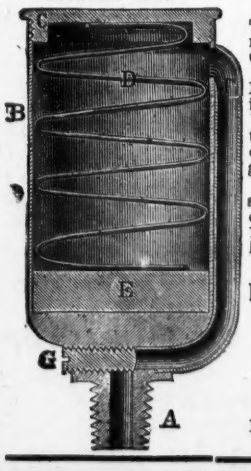

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Talks. Nov. 22, 1879.

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Boiler Proportion and Construction. October 25, Nov. 8, 15 and 22, 1879.

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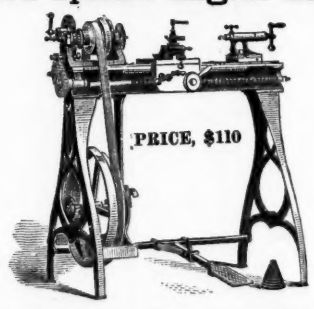

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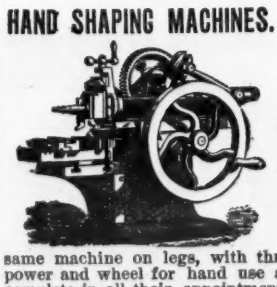

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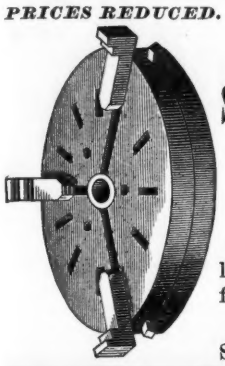

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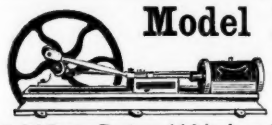

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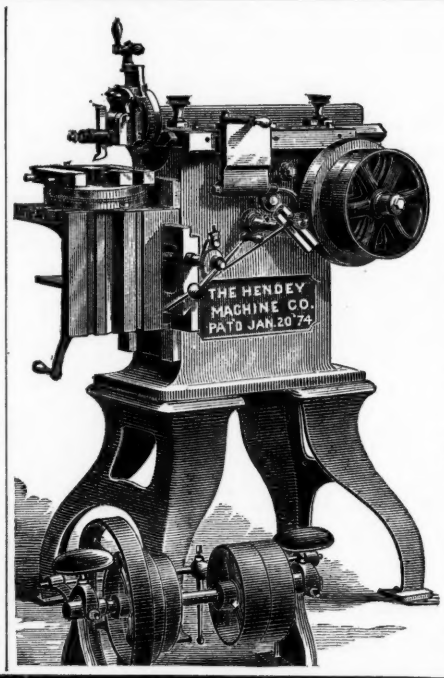

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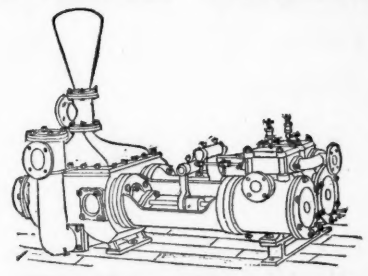

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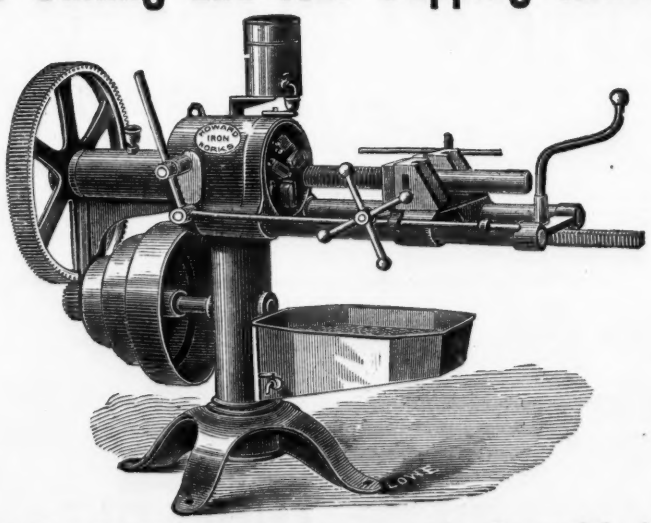

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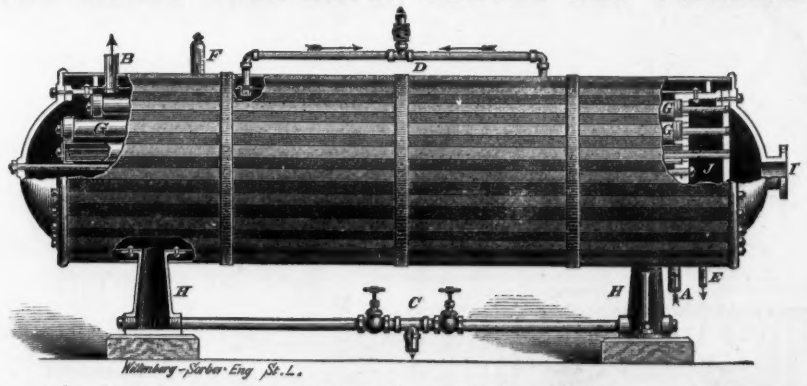

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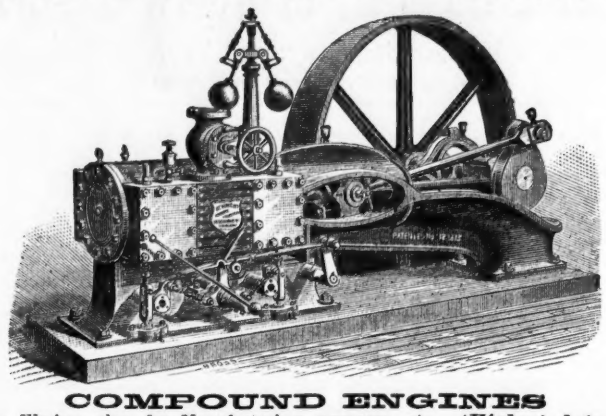

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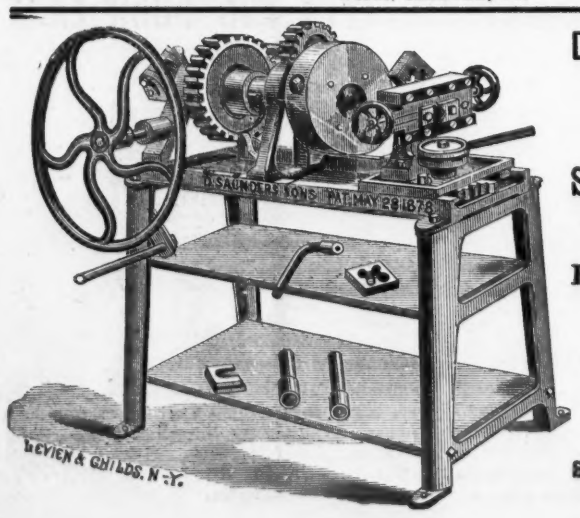

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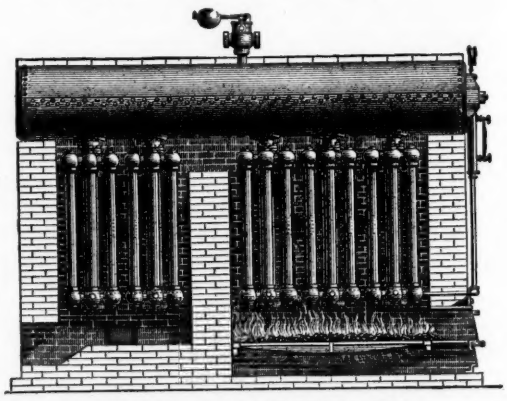

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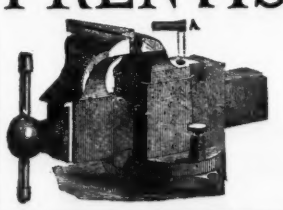

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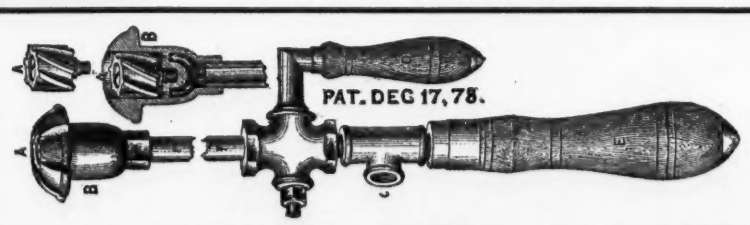

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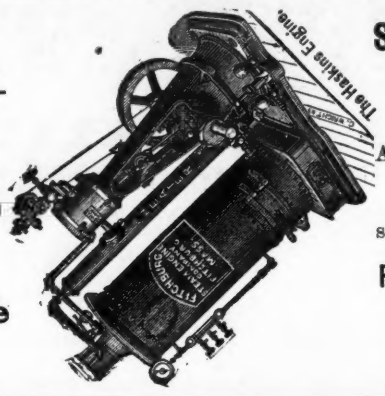

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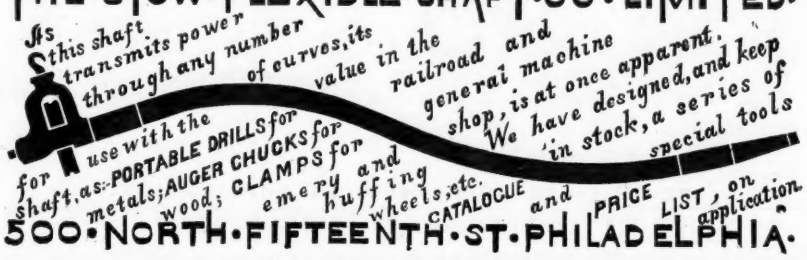
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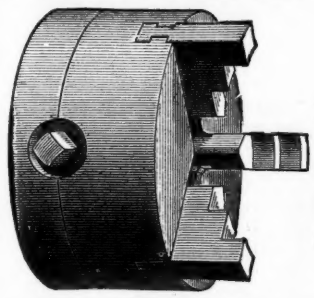

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Two 10 horse Hoisting Engines.
Two 5 " Portable "
One Upright Engine, 16 in.x16 in.
One Horizontal Engine. 5 in.x8 in.
One " Corliss Engine, 10 in.x24 in.
One Locomotive Boiler, 4 ft.x13 ft.
Judson's Governors, from 2 in. to 2½ in.

MACHINISTS' TOOLS.

One Lathe, 28 in.x20 ft.
One " 24 in.x14 ft.
One " 16 in.x7 ft.
One " 40 in.x28 ft.
One Pattern Maker's Lathe.
One Planer, 42 in.x42 in.x16 ft.
One " 42 in.x42 in.x9 ft. (Pond, maker).
One " 30 in.x30 in.x7 ft.
One " 27 in.x24 in.x6 ft. (Pond, maker).
One " 27 in.x22 in.x4 ft.
One Shaper, 12 in. stroke.
One " Stover's make.
One Slotting Machine, 36 in. stroke, 7 ft. wide.
One " " 12 in. stroke, 30 in. wide.
One Bement & Son's Boring Machine.
One Travis' Boring Machine.
One Milling Machine.
Eighteen Drilling Machines.
One Root Blower.
Dudgeon's Punches and Jacks.
One Bogardus Mill. No. 5.
" " " 2.
" Pair Hand Shears.
" " " " Pope's Patent.
One Large Power Punch for bridge iron.
One 3000-Ton Hydraulic Press and Pump.
One Dudgeon Beam Punch.
Cotton Drawing Machine.

WOOD WORKING MACHINERY.

One Schenck Planer and Matcher.
One Patent Hub Boring Machine.
One Daniels Planer, 30 in. wide x 30 ft.
One Carriage Maker's Dressing Machine.

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One " " 26 in. x 14 ft. " "
One " " 26 in. x 13 ft., very heavy.
One " " 22 in. x 21 ft., for shafting, Wh'ler.
One " " 20 in. x 12 ft. Johnson's.
Three " " 20 in. x 8½ ft. Wood, Light & Co.
Three " " 20 in. x 6 ft. Wheeler.
One " " 19 in. x 7 ft. Whitcomb.
One " " 18 in. by 10 ft. Wheeler.
One " " 18 in. x 8½ ft. Wood, Light & Co.
Three " " 18 in. x 7 ft. N. Y. S. Eng. Co.
One " " 16 in. x 8 ft. Wheeler, new.
Two " " 16 in. x 7 ft.
Three " " 15 in. x 6 ft. Lathe & Morse.
One " " 13 in. x 5 ft. Gould.
One " " 24 in. x12 ft Not Screw Cutting.
One " " 16 in. x 10 ft. Not Screw Cutting.
One large Chucking Lathe and Chuck.
Two Hand Lathes, 18 in. x 4½ ft.
One " " 15 in; x 8 ft. Pratt & Whitney.
One " " 13 in. x 5 ft.
Six " " 11 in. x 4½ ft. New Spencer.
Six " " 7 in. x 2½ ft. " "
One Planer, 48 in. x 48 in. x 12 ft. Good order. Plass.
One " 31 in. x 31 in. x 7 ft. New. Stover.
One " 30 in. x 30 in. x 7 ft.
One " 30 in. x 30 in. x 6 ft. Wheeler.
One " 24 in. x 24 in. x 4 ft. W. L. & Co.
Two " 22 in. x 22 in. x 4 ft. Wheeler.
One " 22 in. x 22 in. x 5 ft. " New.
One " 20x20x6. Pratt & Whitney.
One Crank Planer, 24 in. stroke.
One 8 in. stroke Shaper. Gould.
One 8 in. " " Pratt & Whitney.
One 24 in. " " Hendey Machine Co.
One Brown & Sharp Universal Milling Machine.
One No. 3 Garvin Milling Machine.
Three Lincoln Pattern Milling Machines.
One Whiton 22 in. Gear Cutter.
One Pond's Index Millers.
One 21 in. Swing Upright Drill. Wheeler.
One Suspension Drill. Bk. Geared, Self-Feed. Pond.
One each No. 0 P. and W. 2 and 3 Spindle Drills.
One each No. 1 P. and W. 3 and No. 2, 4 Spindle Drills.
Three Sensitive Drills, drills to 3-16 in. hole.
One Pratt & Whitney 2-Spindle Profiling Machines.
One Brown & Sharpe Tapping Machine.
One No. 1 Brown & Sharpe " " Chasing Bar.
One No. 2 " " " " "
One No. 4 Stile's Punch Press.
One No. 3 Stile's Punch Press.
One 10 H. P. Baxter Engine.
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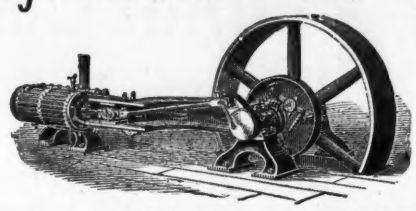

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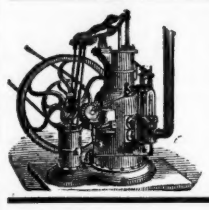

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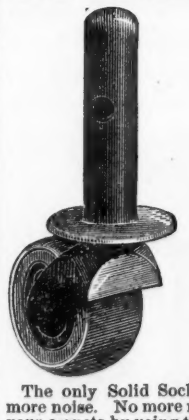

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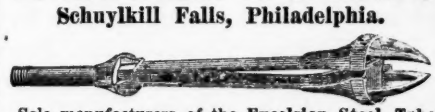

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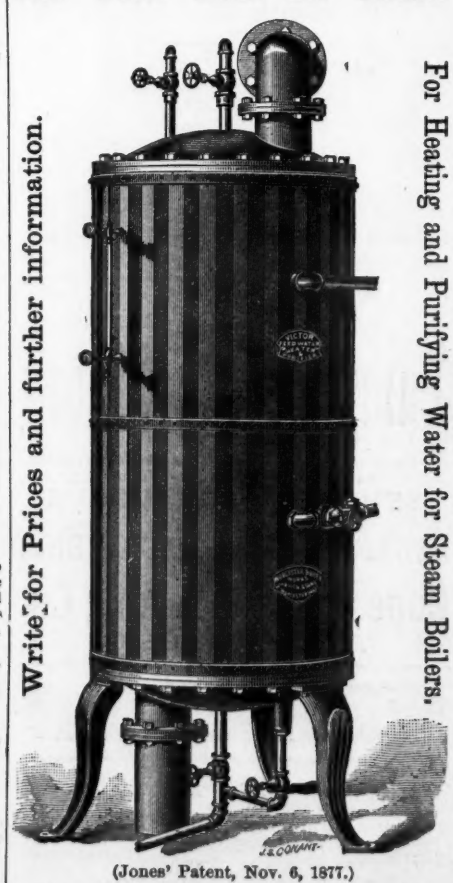

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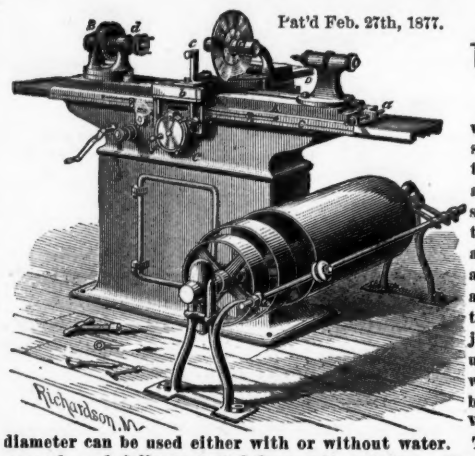

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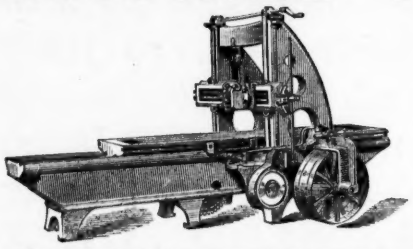

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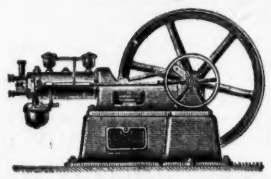

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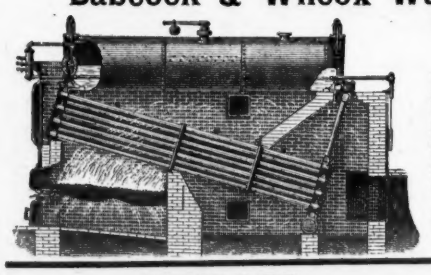

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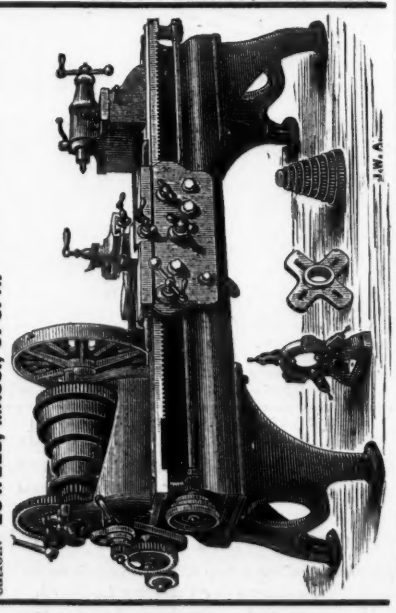

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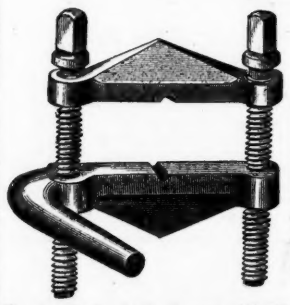

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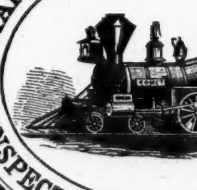

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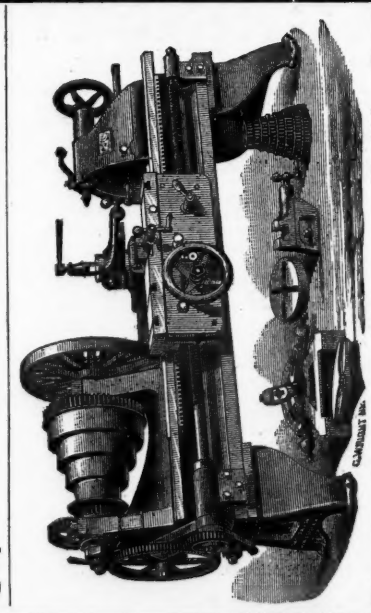

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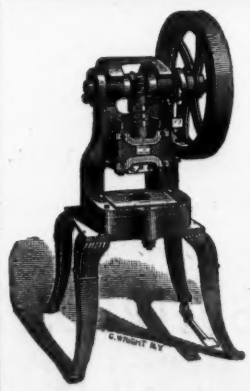

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